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TABLES FOR COMPUTING THE INSTANTANEOUS VELOCITIES INDUCED AT THE BLADE AXES OF A LIFTING ROTOR IN FORWARD FLIGHT BY THE SKEWED HELICAL WAKE VORTICES AND A METHOD FOR CALCULATING THE RESULTANT BLADE AIR LOADS

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11. Abstract:

Tables for computing the instantaneous velocities induced at the blade axes of lifting rotors having 1, 2, 3, or 4 blades operating in forward flight. Example of the application of the results to calculate blade air load distributions. Comparison with experimental flight test data.

TABLES FOR COMPUTING THE INSTANTANEOUS VELOCITIES INDUCED AT THE BLADE AXES OF A LIFTING ROTOR IN FORWARD FLIGHT BY THE SKEWED HELICAL WAKE VORTICES AND A METHOD FOR CALCULATING THE RESULTANT BLADE AIR LOADS

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SUMMARY

Assuming initially that all magnitudes in the induced velocity field are small compared to that of the freestream and that the wake vortex system generated by the rotor are carried downstream sufficiently rapidly so that self-induced effects on the wake system were negligible, the distributions of normal component of instantaneous induced velocity along the axis of a reference rotor blade were computed and tabulated versus blade radius for each 30° increment in blade azimuth angle. The tabulations cover rotor systems having 1, 2, 3, and 4 blades operating at forward speed to rotational tip-speed ratios $\mu = 0.2$, 0.3 , and 0.4 . A wake angle $\chi = \text{Arctan}(10) = 84.29°$, considered as being typical of that for flight conditions in the upper half of the helicopter speed range, was used in the computations.

The continuous, skewed helical portion of the rotor's trailing vortex system was considered to consist of three parts: a system composed of root and tip vortices alone; a system composed of a vortex sheet having uniform strength together with its associated root and tip vortices; and a system composed of a vortex sheet having a strength which varies linearly with the blade radius together with the associated root and tip vortices.

Each of these systems were synthesized separately by first superposing the induced effects at a point p on the axis of a reference blade arising from a discreet set of individual skewed, helical vortex filaments shed from each generating blade. The effect of each filament at p was obtained by a numerical approximation to the Biot-Savart integral associated with the filament. The superposition then amounted to a simple addition of induced velocities. The final sheet synthesis was then achieved by a second numerical integration over the reference blade axis of the above superposed results.

A method for using the calculated induced velocity distributions to obtain the corresponding blade air load distributions is given in an example. A comparison of the air loads calculated by this method with those obtained from flight test data for a two-bladed rotor operating at a forward speed of 150 ft/sec and a rotor tip-speed of 721 ft/sec indicates that the harmonic variation in wake vortex strength must also be taken into account as well as the time average values used in the present example in order to obtain good agreement at all blade azimuth positions.

INTRODUCTION

The smoke flow studies of reference 1 showed, according to Gray, that the elements of high strength vortex sheet shed from the tip sections of a helicopter rotor blade are essentially rolled up into a strong tip vortex within a few chord lengths behind the blade. The experiments also showed that the inboard portion of the blade trailing vortex sheet, which is mainly composed of elements of opposite rotation from the tip elements, does not appear to undergo any appreciable roll-up.

Since the diffuse skewed helical vortex sheets cannot induce any large local irregularities in the blade inflow angle (and hence also in the load distributions), the velocity field induced at the blade axes by the tip vortices was investigated in reference 2 for the higher speed flight conditions in which the position of the wake helices could be assumed known. It was found that the harmonic increments in blade loading arising from the velocity field induced by the tip vortices were of significant amplitude and that both phase and amplitude were very dependent upon the number of blades in the rotor and the forward speed to rotational tip-speed ratio. It was also found that the amplitude and, to a small extent, the phase were functions of the wake angle. In addition, some approximate calculations showed that for the higher speed flight conditions the induced power required was a function of the number of blades, rotors with fewer blades having the larger induced power required as might be expected.

The present investigation was initially planned to use the computed values for skewed helical filaments given in reference 2 to obtain, by a

method of superposition, a sufficient number of generalized induced velocity distributions to permit a comparison with flight test or wind tunnel measurements. However, the labor involved in the interpolation of these results and the subsequent superposition was prohibitive. It became necessary to program the entire computation on a high speed computer in such a way as to obtain the superposed induced velocity at each of a systematic set of points on each blade axis.

NOTATION

A	Function of the parameter θ' defined by Equation (46a)
A^*	Function of the parameter θ' defined by Equation (46b)
A_0	Collective pitch angle at blade station $r = 3R/4$
$[A]$	Coefficient matrix defined by Equation (37a)
$[A]^{-1}$	Inverse of the matrix A
$\lvert A \rvert$	Determinant of the matrix A
a	Slope of blade element lift curve
a_1	Lateral cyclic pitch coefficient
a_0	Blade coning angle
B	Function of the parameter θ' defined by Equation (46c)
B^*	Function of the parameter θ' defined by Equation (46d)
B_{11} , B_{21}	Elements of a column matrix defined by Equations (37d)
b	Number of blades in a rotor system
b_1	Longitudinal cyclic pitch coefficient
C	Function of the parameter θ' defined by Equation (46e)
$C_k(x)$	Polynomial coefficient defined in Equations (10)
C_T	Mean rotor blade thrust coefficient
C_{M_x}	Mean rotor air rolling moment coefficient
C_{M_y}	Mean rotor air pitching moment coefficient
C_{M_0}	Mean blade-root thrust moment coefficient
$[C]$	Coefficient matrix defined by Equation (37e)
c	Blade chord at non-dimensional blade station x
c_ℓ	Blade element lift coefficient

c_{ki}	Constant coefficients appearing in the polynomial $C_k(x)$
D	Length of the vector $\bar{D}$
$\bar{D}$	Vector from a point p in the rotor tip-path plane to a point P on a vortex filament in the rotor wake system
D_F	Rotor drag force
$[D_1]$, $[D_2]$	Constant matrices defined by Equations (59b, c)
$D_{jk}(x_p)$	Harmonic coefficients defined by Equation (54)
E_{11} , E_{21}	Elements of a column matrix defined by Equations (37g)
F_z	Thrust force acting on a blade element perpendicular to the tip-path plane
$F_j(x)$	Polynomials defined for $j = 0 , 1 , 2 , 3 , 4$ by Equations (12a , b , c , d , e)
$f_j(x)$	Polynomial coefficients defined for $j = 0 , 1 , 2 , 3 , 4$ by Equations (63)
$G(x , \psi)$	Higher harmonic correction term appearing in Equation (11) and defined by Equation (12f)
$H(x , \Theta')$	Factor appearing in the integrand of Equation (44) and defined by Equation (45)
$I(x)$	Function of x defined by Equation (47)
I_1	Moment of inertia of a rotor blade about its flapping hinge
I_R	Coefficient defined by Equation (30)
M_x	Mean rotor air rolling moment
M_y	Mean rotor air pitching moment
M_0	Mean blade-root thrust moment
$[M]$	Coefficient matrix defined by Equation (59a)
$[M]^{-1}$	Inverse of the matrix M
$M_{.75}$	Mach number at blade station $r = 3R/4$
P	Point $P(x' , y' , z')$ on a skewed, helical vortex filament in the wake system
$\bar{P}$	Position vector of the point P from the origin of coordinates

p	Point $p(x_p' , y_p' , 0)$ in the tip-path plane
$\bar{p}$	Position vector of the point p from the origin of co-ordinates
R	Rotor radius
r	Radial blade station of blade element
S	Drag area parameter associated with a rotor system
$S_k(x)$	Polynomial coefficient defined in Equations (10)
$[S]$	Coefficient matrix defined by Equation (37f)
s_{ki}	Constant coefficients appearing in the polynomials $S_k(x)$
T	Mean thrust for a rotor system having b blades
U	Component of resultant velocity perpendicular to blade axis at local blade station (x , ψ)
V	Freestream or flight-path velocity
V_i	Distribution of normal component of induced velocity along the axis of a reference blade
$(V_i)_j$	Components of V_i defined for $j = 0 , 1 , 2$ by Equations (49), (51), and (53)
$\bar{V}_p$	Vector velocity induced at a point p in the rotor plane defined by Equation (39)
V_{pz}	Normal component of the vector velocity $\bar{V}_p$
$(V_{pz})_1$ $(V_{pz})_2$	Component parts of the velocity V_{pz} defined by Equation (48)
V_f	Fundamental or non-induced velocity at blade station (x , ψ) defined by Equation (62)
v_a	Normal component of forward to tip-speed ratio defined by Equation (8)
v_s	Velocity of sound
W	Gross weight of helicopter
x	Non-dimensional blade radius r/R

x_0	Non-dimensional blade-root radius r_0/R
(r, ψ, z)	Co-ordinate designations for a system of cylindrical co-ordinates having its origin fixed at the rotor hub
(x', y', z')	Co-ordinate designations for a Cartesian co-ordinate system having its origin fixed at the rotor hub
α_R	Angle of attack of tip-path plane
Γ	Local blade circulation at blade station (x, ψ)
$\overline{\Gamma}$	Mean local blade circulation averaged with respect to azimuth angle
Γ_j	Component parts of the mean circulation $\overline{\Gamma}$ defined for $j = 0, 1, 2$ by Equations (14a, b, c)
γ_j	Constants defined in terms of the Γ_j by Equations (38)
ψ	Rotor blade azimuth angle
χ	Wake angle
ϕ	Inflow angle at blade element
θ	Pitch angle of blade element
θ_1	Rotor blade twist angle
Ω	Rotor angular velocity
μ	In-plane component of forward to tip-speed ratio defined by Equation (7)
ρ	Air density
σ_n	Coefficient defined by Equation (33)
θ'	Angular parameter appearing in the parametric Equations (42) which describe the skewed, helical vortex filaments in the wake vortex system
θ'_g	Angular position of a generating blade measured clockwise from the upwind $(\psi = 180°)$ azimuth position

ANALYSIS

I. Blade Circulation Distribution

The analysis of this section depends upon the following basic assumptions:

(1) The helicopter is operating in the upper half of its speed range in forward flight and hence the magnitudes of the velocities induced in the tip-path plane by the wake systems are small compared to the free stream velocity V and the rotational velocity ΩR.

(2) The effects of blade deflection and higher harmonic flapping motion on the blade-bound vortex system are perturbations of small order.

(3) Two-dimensional, steady state airfoil theory applies.

Under the above assumptions, the local blade element lift coefficient c_ℓ is given by the relation

$$c_\ell = a \sin(\theta + \varphi)$$

$$= a(\sin\theta\cos\varphi + \cos\theta\sin\varphi) \qquad (1)$$

where

a = slope of blade element lift curve

φ = inflow angle at the blade element

and

θ = pitch angle of blade element at radius r and azimuth angle ψ given by the equation

$$\theta = A_0 + \left(\frac{3}{4} - x\right)\theta_1 - a_1 \sin\psi + b_1 \cos\psi \qquad (2)$$

in which

A_o = collective pitch angle at $r = \frac{3}{4} R$

x = non-dimensional radius $\frac{r}{R}$

θ_1 = blade twist angle

a_1 = lateral cyclic pitch coefficient

b_1 = longitudinal cyclic pitch coefficient

In the above definitions all blade angles are measured between the zero lift chord line of the blade element and the plane of rotation (tip-path plane). The azimuth angle ψ is measured from the downwind longitudinal axis of the rotor plane.

The local blade circulation $\Gamma(x, \psi)$ can be written

$$\Gamma = \frac{1}{2} U c c_\ell$$

$$= \frac{1}{2} a c \left[\sin\theta (U\cos\phi) + \cos\theta (U\sin\phi) \right] \quad (3)$$

where

c = blade chord at radius x

U = component of resultant velocity perpendicular to the blade axis at blade station (x, ψ)

Under the assumed flight conditions, the blade pitch angle θ is sufficiently small so that the approximations $\sin\theta \approx \theta$ and $\cos\theta \approx 1$ are applicable. Hence, equation (3) reduces to

$$\Gamma = \frac{1}{2} a c \left[\theta (U\cos\phi + U\sin\phi \right] \quad (4)$$

Also, from a consideration of the rotor geometry one can write

$$U\cos\phi = \Omega R (x + \mu \sin\psi) \quad (5)$$

$$U\sin\varphi = \Omega R\left[V_o - \mu a_o \cos\psi - \frac{V_i}{\Omega R}\right] \quad (6)$$

where

$V_i(x, \psi)$ = component of the induced velocity normal to the tip-path plane at the blade axis

a_o = blade coning angle

$$\mu = \frac{V}{\Omega R}\cos\alpha_R \quad (7)$$

$$V_o = \frac{V}{\Omega R}\sin\alpha_R \quad (8)$$

in which

α_R = angle of attack of tip-path plane

It is assumed than in steady, high-speed forward flight the distribution of normal component of induced velocity along a reference blade axis is a continuous function $V_i = V_i(x, \psi)$ which can be approximated by a finite trigonometric series with polynomial coefficients of the form

$$\frac{V_i}{\Omega R} \approx \sum_{K=0}^{N}\left[C_K(x)\cos K\psi + S_K(x)\sin K\psi\right] \quad (9)$$

where

$$\begin{cases} C_K(x) = \sum_{i=0}^{n_K} \kappa_{Ki} x^i \\ S_K(x) = \sum_{i=0}^{m_K} \sigma_{Ki} x^i \end{cases} \quad (10)$$

Substitution of equations (2), (5), (6), (9), and (10) into equation (4) and arrangement according to harmonics in ψ yields the result

$$\Gamma = \frac{1}{2} a c \Omega R \left[F_0(x) + F_1(x) \sin\psi + F_2(x) \cos\psi + F_3(x) \sin 2\psi + F_4(x) \cos 2\psi - G(x,\psi) \right] \quad (11)$$

in which

$$F_0(x) = \left(V_a - \frac{1}{2}\mu a_1 - c_{00}\right) + \left(A_0 + \frac{3}{4}\theta_1 - c_{01}\right) x - \left(\theta_1 + c_{02}\right) x^2 - \sum_{i=3}^{n_0} c_{0i} x^i \quad (12a)$$

$$F_1(x) = \left[\mu\left(A_0 + \frac{3}{4}\theta_1\right) - s_{10}\right] - \left(a_1 + \mu\theta_1 + s_{11}\right) x - \sum_{i=2}^{m_1} s_{1i} x^i \quad (12b)$$

$$F_2(x) = -\left(\mu a_0 + c_{10}\right) + \left(b_1 - c_{11}\right) x - \sum_{i=2}^{n_1} c_{1i} x^i \quad (12c)$$

$$F_3(x) = \frac{1}{2}\mu b_1 - S_2(x) \quad (12d)$$

$$F_4(x) = \frac{1}{2}\mu a_1 - C_2(x) \quad (12e)$$

$$G(x,\psi) = \sum_{K=3}^{N} \left[C_K(x) \cos\psi + S_K(x) \sin\psi \right] \quad (12f)$$

Returning to equation (11) and averaging with respect to ψ yields for the mean blade circulation

$$\bar{\Gamma} = \frac{1}{2\pi}\int_0^{2\pi} \Gamma \, d\psi = \frac{1}{2} a c \Omega R F_0(x)$$
$$= \frac{1}{2} a c \Omega R \left[\left(V_0 - \frac{1}{2}\mu a_1 - \kappa_{00}\right) + \left(A_0 + \frac{3}{4}\theta_1 - \kappa_{01}\right) x - \left(\theta_1 + \kappa_{02}\right) x^2 - \sum_{i=3}^{n_0} \kappa_{0i} x^i \right]$$
$$= \left(\Gamma_0 + \Gamma_1 x + \Gamma_2 x^2\right) - \frac{1}{2} a c \Omega R \sum_{i=3}^{n_0} \kappa_{0i} x^i \qquad (13)$$

in which

$$\Gamma_0 = \frac{1}{2} a c \Omega R \left(V_0 - \frac{1}{2}\mu a_1 - \kappa_{00}\right) \qquad (14a)$$

$$\Gamma_1 = \frac{1}{2} a c \Omega R \left(A_0 + \frac{3}{4}\theta_1 - \kappa_{01}\right) \qquad (14b)$$

$$\Gamma_2 = \frac{1}{2} a c \Omega R \left(-\theta_1 - \kappa_{02}\right) \qquad (14c)$$

The terms in parenthesis in the right-member of equation (13) represent a fundamental part of the mean blade circulation which takes into account the first three coefficients c_{00}, c_{01}, and c_{02} of the mean induced normal component of velocity $C_0(x)$ appearing in equation (9). Thus, the neglection of cubic and greater powers of x yields the parabolic approximation

$$\Gamma \approx \Gamma_0 + \Gamma_1 x + \Gamma_2 x^2 \qquad (15)$$

II. Mean Rotor Blade Thrust Coefficient

Let a cylindrical (r, ψ, z) co-ordinate system be fixed at the rotor hub with its positive z-axis coinciding with the upper tip-path plane axis. Then, the differential thrust force acting on a blade element at $(r, \psi, 0)$ can be written

$$dF_z = \rho(U\cos\varphi)\Gamma dr$$
$$= \rho\Omega R^2(x + \mu\sin\psi)\Gamma dx \qquad (16)$$

where Γ is given by equation (11). The mean thrust T for a rotor having b blades is given by

$$T = \frac{b}{2\pi}\int_{r_o}^{R}\int_{0}^{2\pi} dF_z\, d\psi$$
$$= \frac{b}{2\pi}\int_{x_o}^{1}\int_{0}^{2\pi}\frac{dF_z}{dx}\, d\psi\, dx \qquad (17)$$

in which $x_o = r_o/R$ is the non-dimensional blade-root radius. Substituting from equations (11) and (16) into (17) and taking advantage of the orthogonality of the trigonometric harmonics by integrating first with respect to ψ reduces the integral to

$$T = \frac{1}{2}\rho\pi a b\Omega^2 R^4\int_{x_o}^{1}\frac{c}{\pi R}\left[xF_0(x) + \frac{1}{2}\mu F_1(x)\right]dx \qquad (18)$$

from which the mean rotor blade thrust coefficient C_T is found to be

$$C_T = \frac{T}{\rho \pi \Omega^2 R^4}$$

$$= \frac{1}{2} ab \int_{x_o}^{1} \frac{c}{\pi R} \left[x F_o(x) + \frac{1}{2} \mu F_1(x) \right] dx \qquad (19)$$

$F_o(x)$ and $F_1(x)$ being given by equations (12a) and (12b), respectively.

III. Mean Rotor Air Rolling Moment Coefficient

The mean rolling moment M_x for a rotor having b blades is given by the relation

$$M_x = \frac{b}{2\pi} \int_{r_o}^{R} \int_{0}^{2\pi} r \sin\psi \, dF_z \, d\psi$$

$$= \frac{bR}{2\pi} \int_{x_o}^{1} \int_{0}^{2\pi} x \sin\psi \frac{dF_z}{dx} \, d\psi \, dx \qquad (20)$$

Substituting from equations (11) and (16) into this expression and integrating with respect to ψ then yields

$$M_x = \frac{1}{2} \rho \pi \Omega^2 R^5 \left(\frac{ab}{2} \right) \int_{x_o}^{1} \frac{c}{\pi R} \left[\mu x F_o(x) + x^2 F_1(x) \right] dx \qquad (21)$$

from which the mean rotor rolling moment coefficient C_{M_x} is found to be

$$C_{M_x} = \frac{M_x}{\frac{1}{2} \rho \pi \Omega^2 R^5} = \frac{ab}{2} \int_{x_o}^{1} \frac{c}{\pi R} \left[\mu x F_o(x) + x^2 F_1(x) \right] dx \qquad (22)$$

IV. Mean Rotor Air Pitching Moment Coefficient

Paralleling the procedure of the preceding section, the mean rotor pitching moment M_y can be written

$$M_y = \frac{b}{2\pi}\int_{r_0}^{R}\int_{0}^{2\pi} r\cos\psi\, dF_z\, d\psi$$

$$= \frac{bR}{2\pi}\int_{x_0}^{1}\int_{0}^{2\pi} x\cos\psi\, \frac{dF_z}{dx}\, d\psi\, dx$$

$$= \frac{1}{2}\rho\pi\Omega^2R^5\left(\frac{ab}{2}\right)\int_{x_0}^{1}\frac{c}{\pi R}\left[x^2F_2(x) + \frac{1}{2}\mu x F_3(x)\right]dx \quad (23)$$

which immediately yields the mean pitching moment coefficient

$$C_{M_y} = \frac{M_y}{\frac{1}{2}\rho\pi\Omega^2R^5} = \frac{ab}{2}\int_{x_0}^{1}\frac{c}{\pi R}\left[x^2F_2(x) + \frac{1}{2}\mu x F_3(x)\right]dx \quad (24)$$

with $F_2(x)$ being given by equation (12c).

V. Mean Blade-Root Thrust Moment Coefficient

An approximation for the mean blade-root thrust moment M_o can be obtained by assuming that the flapping hinge is small and that the coning angle is small. Then, for a single blade

$$M_o \approx \frac{1}{2\pi}\int_{r_0}^{R}\int_{0}^{2\pi} r\, dF_z\, d\psi = \frac{R}{2\pi}\int_{x_0}^{1}\int_{0}^{2\pi} x\frac{dF_z}{dx}\, d\psi\, dx$$

$$= \frac{1}{2}\rho\pi\Omega^2R^5a\int_{x_0}^{1}\frac{c}{\pi R}\left[x^2F_0(x) + \frac{1}{2}\mu x F_1(x)\right]dx \quad (25)$$

and hence, the mean blade-root thrust moment coefficient is approximately

$$C_{M_o} = \frac{M_o}{\frac{1}{2}\rho\pi\Omega^2R^5} \approx a\int_{x_0}^{1}\frac{c}{\pi R}\left[x^2F_0(x) + \frac{1}{2}\mu x F_1(x)\right]dx \quad (26)$$

On the other hand, from a consideration of centrifugal forces in blade element theory, it is known that

$$r\,dF_z \approx a_o \Omega^2 r^2 m(r)\,dr \tag{27}$$

in which $m(r)$ is the mass of a blade element at radius r. Hence,

$$M_o \approx \frac{1}{2\pi}\int_{r_o}^{R}\int_{0}^{2\pi} r\,dF_z\,d\psi \approx a_o\Omega^2\int_{r_o}^{R} r^2 m(r)\,dr$$

$$= a_o \Omega^2 I_1 \tag{28}$$

in which I_1 represents the moment of inertia of one blade about its flapping hinge (assumed here to be at $r = 0$). Using equation (28), one can write

$$C_{M_o} = \frac{M_o}{\frac{1}{2}\rho\pi\Omega^2 R^5} \approx \frac{a a_o \Omega^2 I_1}{\frac{1}{2}\rho\pi a \Omega^2 R^5} = a I_R a_o \tag{29}$$

in which

$$I_R = \frac{I_1}{\frac{1}{2}\rho\pi a R^5} \tag{30}$$

Equating the right-members of equations (26) and (29) then gives

$$I_R a_o = \int_{x_o}^{1} \frac{c}{\pi R}\left[x^2 F_o(x) + \frac{1}{2}\mu x F_1(x)\right] dx \tag{31}$$

VI. Approximations for Equilibrium Values of A_o, a_o, a_1, and b_1

Assuming that in steady, high-speed forward flight the mean rotor rolling and pitching moments must be negligible, equations (19), (22), (24), and (31), taken in order, yield the system of approximations

(treated as equations)

$$\int_{x_0}^{1} \frac{c}{\pi R}\left[x F_0(x) + \tfrac{1}{2}\mu F_1(x)\right]dx = \frac{C_T}{\frac{1}{2}ab} \tag{32a}$$

$$\int_{x_0}^{1} \frac{c}{\pi R}\left[\mu x F_0(x) + x^2 F_1(x)\right]dx = 0 \tag{32b}$$

$$\int_{x_0}^{1} \frac{c}{\pi R}\left[x^2 F_2(x) + \tfrac{1}{2}\mu x F_3(x)\right]dx = 0 \tag{32c}$$

$$\int_{x_0}^{1} \frac{c}{\pi R}\left[x^2 F_0(x) + \tfrac{1}{2}\mu x F_1(x)\right]dx = I_{\tilde{R}}\, a_0 \tag{32d}$$

Adopting the notation

$$\sigma_n = \int_{x_0}^{1} \frac{c}{\pi R}\, x^{n-1}\, dx \tag{33}$$

and using equations (12), it follows that

$$\int_{x_0}^{1} \frac{c}{\pi R}\, x^{n-1} F_0(x)\, dx = \left(v_a - \tfrac{1}{2}\mu a_1 - \kappa_{00}\right)\sigma_n + \left(A_0 + \tfrac{3}{4}\theta_1 - \kappa_{01}\right)\sigma_{n+1} - \left(\theta_1 + \kappa_{02}\right)\sigma_{n+2} - \sum_{i=3}^{n_0} \kappa_{0i}\,\sigma_{i+n} \tag{34a}$$

$$\int_{x_0}^{1} \frac{c}{\pi R}\, x^{n-1} F_1(x)\, dx = \mu\left(A_0 + \tfrac{3}{4}\theta_1\right) - s_{10}\,\sigma_n - \left(a_1 + \mu\theta_1 + s_{11}\right)\sigma_{n+1} - \sum_{i=2}^{n_1} s_{1i}\,\sigma_{i+n} \tag{34b}$$

$$\int_{x_0}^{1} \frac{c}{\pi R}\, x^{n-1} F_2(x)\, dx = -\left(\mu a_0 + \kappa_{10}\right)\sigma_n + \left(b_1 - \kappa_{11}\right)\sigma_{n+1} - \sum_{i=2}^{n_1} \kappa_{1i}\,\sigma_{i+n} \tag{34c}$$

$$\int_{x_0}^{1} \frac{c}{\pi R} x^{n-1} F_3(x)\,dx = \frac{1}{2}\mu b_1 \sigma_n - \sum_{i=0}^{m_2} s_{2i}\,\sigma_{i+n} \qquad (34d)$$

Hence, substituting from equations (34) into equations (32) and arranging terms so as to display the coefficients of A_o, a_o, a_1, and b_1 yields the system

$$\left(1+\frac{1}{2}\mu^2\frac{\sigma_1}{\sigma_3}\right)A_0 - \mu\frac{\sigma_2}{\sigma_3}a_1 = \frac{C_T}{\frac{1}{2}ab\sigma_3}$$
$$-V_a\frac{\sigma_2}{\sigma_3} - \theta_1\left(\frac{3}{8}\mu^2\frac{\sigma_1}{\sigma_3} - \frac{1}{2}\mu^2\frac{\sigma_2}{\sigma_3} + \frac{3}{4} - \frac{\sigma_4}{\sigma_3}\right)$$
$$+\left(c_{00}\frac{\sigma_2}{\sigma_3} + c_{01} + c_{02}\frac{\sigma_4}{\sigma_3}\right)$$
$$+\frac{1}{2}\mu\left(s_{10}\frac{\sigma_1}{\sigma_3} + s_{11}\frac{\sigma_2}{\sigma_3} + s_{12}\right)$$
$$+\frac{1}{\sigma_3}\left[\sum_{i=3}^{n_0} c_{0i}\,\sigma_{i+2} + \frac{1}{2}\mu\sum_{i=3}^{m_1} s_{1i}\,\sigma_{i+1}\right] \qquad (35a)$$

$$\left(2\mu\frac{\sigma_3}{\sigma_4}\right)A_0 - \left(1+\frac{1}{2}\mu^2\frac{\sigma_2}{\sigma_4}\right)a_1 = -\mu V_a\frac{\sigma_2}{\sigma_4}$$
$$+\theta_1\left(2\mu - \frac{3}{2}\mu\frac{\sigma_3}{\sigma_4}\right) + \mu\left(c_{00}\frac{\sigma_2}{\sigma_4} + c_{01}\frac{\sigma_3}{\sigma_4} + c_{02}\right)$$
$$+\left(s_{10}\frac{\sigma_3}{\sigma_4} + s_{11} + s_{12}\frac{\sigma_5}{\sigma_4}\right)$$
$$+\frac{1}{\sigma_4}\left[\mu\sum_{i=3}^{n_0} c_{0i}\,\sigma_{i+2} + \sum_{i=3}^{m_1} s_{1i}\,\sigma_{i+3}\right] \qquad (35b)$$

$$\left(-\mu\frac{\sigma_3}{\sigma_4}\right)a_0 + \left(1+\frac{1}{4}\mu^2\frac{\sigma_2}{\sigma_4}\right)b_1 = \left(c_{10}\frac{\sigma_3}{\sigma_4} + c_{11} + c_{12}\frac{\sigma_5}{\sigma_4}\right)$$
$$+\frac{1}{2}\mu\left(s_{20}\frac{\sigma_2}{\sigma_4} + s_{21}\frac{\sigma_3}{\sigma_4} + s_{22}\right)$$
$$+\frac{1}{\sigma_4}\left[\sum_{i=3}^{n_1} c_{1i}\,\sigma_{i+3} + \frac{1}{2}\mu\sum_{i=3}^{m_2} s_{2i}\,\sigma_{i+2}\right] \qquad (35c)$$

$$\left(1+\tfrac{1}{2}\mu^2\frac{\sigma_2}{\sigma_4}\right)A_0-\frac{I_R}{\sigma_4}a_0-\mu\frac{\sigma_3}{\sigma_4}a_1$$
$$=-V_a\frac{\sigma_3}{\sigma_4}-\theta_1\left(\tfrac{3}{8}\mu^2\frac{\sigma_2}{\sigma_4}-\tfrac{1}{2}\mu^2\frac{\sigma_3}{\sigma_4}+\tfrac{3}{4}-\frac{\sigma_5}{\sigma_4}\right)$$
$$+\left(\kappa_{00}\frac{\sigma_3}{\sigma_4}+\kappa_{01}+\kappa_{02}\frac{\sigma_5}{\sigma_4}\right)$$
$$+\tfrac{1}{2}\mu\left(s_{10}\frac{\sigma_2}{\sigma_4}+s_{11}\frac{\sigma_3}{\sigma_4}+s_{12}\right)$$
$$+\frac{1}{\sigma_4}\left[\sum_{i=3}^{n_0}\kappa_{0i}\sigma_{i+3}+\tfrac{1}{2}\mu\sum_{i=3}^{m_1}s_{1i}\sigma_{i+2}\right] \qquad (35d)$$

Given a set of rotor parameters u, v_a, θ_1, Ω, a, b, c, R and a knowledge of the coefficients c_{ki} and s_{ki} obtained through harmonic analysis of either experimental or computed induced velocity distributions, equations (35) may be solved for the equilibrium values of A_0, a_0, a_1, and b_1. An example of their use is presented in a later section. In anticipation of this, it is convenient to present the solution of equations (35a, b) for A_0 and a_1 in the matrix form

$$\begin{bmatrix}A_0\\ a_1\end{bmatrix}=[A]^{-1}\left[\begin{bmatrix}B_{11}\\ B_{21}\end{bmatrix}+[C]\begin{bmatrix}\kappa_{00}\\ \kappa_{01}\\ \kappa_{02}\end{bmatrix}+[S]\begin{bmatrix}s_{10}\\ s_{11}\\ s_{12}\end{bmatrix}+\begin{bmatrix}E_{11}\\ E_{21}\end{bmatrix}\right] \qquad (36)$$

in which

$$[A]=\begin{bmatrix}\left(1+\tfrac{1}{2}\mu^2\frac{\sigma_1}{\sigma_3}\right) & -\mu\frac{\sigma_2}{\sigma_3}\\ 2\mu\frac{\sigma_3}{\sigma_4} & -\left(1+\tfrac{3}{4}\mu^2\frac{\sigma_2}{\sigma_4}\right)\end{bmatrix} \qquad (37a)$$

$$[A]^{-1}=\frac{1}{|A|}\begin{bmatrix}-\left(1+\tfrac{3}{4}\mu^2\frac{\sigma_2}{\sigma_4}\right) & \mu\frac{\sigma_2}{\sigma_3}\\ -2\mu\frac{\sigma_3}{\sigma_4} & \left(1+\tfrac{1}{2}\mu^2\frac{\sigma_1}{\sigma_3}\right)\end{bmatrix} \qquad (37b)$$

$$|A| = 2\mu^2\frac{\sigma_2}{\sigma_4} - \left(1+\frac{1}{2}\mu^2\frac{\sigma_1}{\sigma_3}\right)\left(1+\frac{3}{4}\mu^2\frac{\sigma_2}{\sigma_4}\right) \tag{37c}$$

$$\begin{cases} B_{11} = \dfrac{2C_T}{ab\sigma_3} - V_0\dfrac{\sigma_2}{\sigma_3} + \left(-\dfrac{3}{4} - \dfrac{3}{8}\mu^2\dfrac{\sigma_1}{\sigma_3} + \dfrac{1}{2}\mu^2\dfrac{\sigma_2}{\sigma_3} + \dfrac{\sigma_4}{\sigma_3}\right)\theta_1 \\ B_{21} = -\mu V_0\dfrac{\sigma_2}{\sigma_4} + \left(2\mu - \dfrac{3}{2}\mu\dfrac{\sigma_3}{\sigma_4}\right)\theta_1 \end{cases} \tag{37d}$$

$$[C] = \begin{bmatrix} \dfrac{\sigma_2}{\sigma_3} & 1 & \dfrac{\sigma_4}{\sigma_3} \\ \mu\dfrac{\sigma_2}{\sigma_4} & \mu\dfrac{\sigma_3}{\sigma_4} & \mu \end{bmatrix} \tag{37e}$$

$$[S] = \begin{bmatrix} \frac{1}{2}\mu\dfrac{\sigma_1}{\sigma_3} & \frac{1}{2}\mu\dfrac{\sigma_2}{\sigma_3} & \frac{1}{2}\mu \\ \dfrac{\sigma_3}{\sigma_4} & 1 & \dfrac{\sigma_5}{\sigma_4} \end{bmatrix} \tag{37f}$$

$$\begin{cases} E_{11} = \dfrac{1}{\sigma_3}\left\{\displaystyle\sum_{i=3}^{n_0} c_{0i}\,\sigma_{i+2} + \frac{1}{2}\mu\sum_{i=3}^{m_1} a_{1i}\,\sigma_{i+1}\right\} \\ E_{21} = \dfrac{1}{\sigma_4}\left\{\mu\displaystyle\sum_{i=3}^{n_0} c_{0i}\,\sigma_{i+2} + \sum_{i=3}^{m_1} a_{1i}\,\sigma_{i+3}\right\} \end{cases} \tag{37g}$$

Equation (36) is particularly adapted for use in any iterative process for A_0 and a_1. It is also convenient to rewrite equations (14) in the form

$$\gamma_0 = \frac{\Gamma_0}{4\pi\Omega R^2} = \frac{ac}{8\pi R}\left(V_0 - \frac{1}{2}\mu a_1 - \epsilon_{00}\right) \tag{38a}$$

$$\gamma_1 = \frac{\Gamma_1}{4\pi\Omega R^2} = \frac{ac}{8\pi R}\left(A_0 + \frac{3}{4}\theta_1 - \epsilon_{01}\right) \tag{38b}$$

$$\gamma_2 = \frac{\Gamma_2}{4\pi\Omega R^2} = \frac{ac}{8\pi R}\left(-\theta_1 - \epsilon_{02}\right) \tag{38c}$$

VII. The Normal Component of Velocity Induced at a Point on a Reference Blade Axis by the Vortex Sheet Shed from a Single Generating Blade

In addition to the cylindrical (r, ψ, z) co-ordinate system defined in Section II, also let a cartesian (x', y', z') co-ordinate system be fixed at the rotor hub in such a way that the positive x'-axis coincides with the downwind ($\psi = 0°$) longitudinal tip-path plane axis, the positive y'-axis coincides with the lateral ($\psi = 90°$) tip-path plane axis, and the positive z'-axis coincides with the z-axis previously defined. The basic assumptions of this section are as follows:

(1) The wake system has the form of a semi-infinite vortex sheet whose elements are skewed, helical vortex filaments shed from the rotor blade trailing edges.

(2) The wake system is static in the sense that at a given instant the previously generated vortex filaments extend indefinitely downstream, winding about a wake axis which makes a constant angle χ with the negative z'-axis. This assumption implies that under the conditions of steady, high-speed forward flight, the relatively high freestream velocity carries the vortex system downstream sufficiently fast so that there is no appreciable wake distortion due to self-induced effects in the part of the wake of interest.

(3) The mean blade circulation as a function of radius r along a reference blade of length R is given by equation (5); namely,

$$\bar{\Gamma} = \Gamma_0 + \Gamma_1\left(\frac{r}{R}\right) + \Gamma_2\left(\frac{r}{R}\right)^2$$
$$= \Gamma_0 + \Gamma_1 x + \Gamma_2 x^2 \qquad (15)$$

Let $P(x' , y' , z')$ be any point on a skewed, helical vortex filament shed at radius r from a generating blade, and let $p(x'_p , y'_p , 0)$ be any point in the tip-path plane. Then, by the Biot-Savart law, the vector velocity induced at p by the vortex sheet issuing from the generating blade (disregarding for the present blade-root and blade-tip roll-up effects) is given by the integral

$$\vec{V}_p = \frac{1}{4\pi}\int_{r_0}^{R}\int_{0}^{\infty} \frac{\vec{D}\times d\vec{s}}{D^3}\frac{d\bar{\Gamma}}{dr}\,dr \qquad (39)$$

in which, as shown in Figure (1),

$\vec{D}$ = the vector $\vec{pP}$

D = the length of $\vec{D}$

$\vec{ds}$ = the vector differential of arc tangent to the filament at P

In terms of the rectangular co-ordinates, the position vectors of the points P and p from the origin are given by

$$\vec{P} = \vec{i}x' + \vec{j}y' + \vec{k}z' \qquad (40a)$$

$$\vec{p} = \vec{i}x'_p + \vec{j}y'_p \qquad (40b)$$

from which

$$\vec{D} = (x' - x'_p)\vec{i} + (y' - y'_p)\vec{j} + z'\vec{k} \qquad (40c)$$

$$D = \left[(x' - x'_p)^2 + (y' - y'_p)^2 + z'^2 \right]^{\frac{1}{2}} \tag{40d}$$

$$\vec{ds} = \vec{i}\,dx' + \vec{j}\,dy' + \vec{k}\,dz' \tag{40e}$$

and the z-component of the vector cross product in equation (39) is given by

$$\vec{k} \cdot \vec{D} \times \vec{ds} = (x' - x'_p)\,dy' - (y' - y'_p)\,dx' \tag{40f}$$

Hence, the normal component of velocity induced at p (by convention positive in the negative z-direction) becomes

$$\begin{aligned} V_{pz} &= -\vec{k} \cdot \vec{V} \\ &= \frac{1}{4\pi} \int_{r_0}^{R} \int_{0}^{\infty} \left[\frac{(y' - y'_p)\,dx' - (x' - x'_p)\,dy'}{D^3} \right] \frac{d\Gamma}{dr}\,dr \end{aligned} \tag{41}$$

where the indicated line integral is taken along the skewed, helical filament down the wake.

A convenient set of parametric equations for a filament shed at radius r from a generating blade can be written

$$\begin{cases} x' = r\left[\frac{R}{r}\mu\theta' - \cos(\theta' + \theta'_g) \right] \\ y' = r\sin(\theta' + \theta'_g) \\ z' = -r\left(\frac{R}{r}\mu\cot\chi \right)\theta' \end{cases} \tag{42}$$

in which θ'_g is the angular position of the generating blade measured clockwise from the upwind ($\psi = 180°$) tip-path plane axis to the blade axis, and the parameter θ' is measured clockwise from the blade axis. Parametric equations giving the location of the "calculating point" p at

polar position (r_p, ψ_p) on the axis of a reference blade are

$$\begin{cases} x'_p = r_p \cos\psi_p \\ y'_p = r_p \sin\psi_p \end{cases} \tag{43}$$

Substitution from equations (15), (40d), (42), and (43) into (41) and changing the radial variable of integration from r to the nondimensional radius $x = r/R$ now gives

$$V_{pz} = \frac{1}{4\pi R} \int_{x_0}^{1} \int_{0}^{\infty} (\Gamma_1 + 2\Gamma_2 x) H(x, \theta') d\theta' dx \tag{44}$$

where the $H(x, \theta')$ is defined by the relation

$$H(x, \theta') = \frac{(BB^* - AA^*)}{(A^2 + B^2 + C^2)^{3/2}} \tag{45}$$

in which

$$A = \mu\theta' - x\cos(\theta' + \theta'_g) - x_p \cos\psi_p \tag{46a}$$

$$A^* = x\cos(\theta' + \theta'_g) \tag{46b}$$

$$B = x\sin(\theta' + \theta'_g) - x_p \sin\psi_p \tag{46c}$$

$$B^* = \mu + x\sin(\theta' + \theta'_g) \tag{46d}$$

$$C = (\mu \cot\chi)\theta' \tag{46e}$$

Upon writing

$$I(\mu, \chi, x_p, \psi_p, \theta'_g; x) = \int_0^\infty H(x, \theta')\, d\theta' \qquad (47)$$

in which u, χ, x_p, ψ_p, θ'_g are parameters, equation (44) takes the form

$$\begin{aligned} V_{pz} &= \frac{\Gamma_1}{4\pi R} \int_{x_0}^{1} I(x)\, dx + \frac{\Gamma_2}{4\pi R} \int_{x_0}^{1} 2x\, I(x)\, dx \\ &= (V_{pz})_1 + (V_{pz})_2 \end{aligned} \qquad (48)$$

which represents the normal component of velocity induced at a point $p(x_p, \psi_p)$ on a reference blade axis by the vortex sheet shed from a single generating blade. Associated root and tip vortex system effects are not included in this expression.

COMPUTATIONS

VIII. The Initial Superposition of Velocities

The calculations prerequisite to performing the final superposition of velocities described in the next section were carried out according to the following scheme in which the ranges of the parameters and variables are indicated:

$\chi = \mathrm{Tan}^{-1}(10) = 84.3^\circ$ 1 value

$\mu = 0.2\ ,\ 0.3\ ,\ 0.4$ 3 values

$\psi_p = 0^\circ(30^\circ)\ 330^\circ$ 12 values

$x_p = 0.15(0.10)\ 0.95$ 9 values

$$\theta'_g = \begin{cases} \theta'_p & \theta'_p + 180^\circ \\ \theta'_p + 90^\circ & \theta'_p + 240^\circ \\ \theta'_p + 120^\circ & \theta'_p + 270^\circ \end{cases}$$

$x = 0.2(0.1)1.0$ (root at $x_o = 0.2$) 9 values

$\theta' = 0^\circ(10^\circ)\ 3600^\circ$ 10 rev.

In the above, the initial θ'_p corresponding to a value ψ_p was taken as the angle measured from the upwind axis coterminal with ψ_p.

For fixed values of χ, μ, ψ_p, x_p and corresponding to each of the 9 values of x, the integral

$$I(\theta'_g; x) = \int_0^\infty H(x; \theta')\, d\theta'$$

was computed via a Simpson's Rule approximation for each of 6 values of θ'_g. The result of this computation took the form of a 9 x 6 rectangular array giving the values of $I(x\ ,\ \theta'_g)$ corresponding to one calculating

point $p(x_p , \psi_p)$. An initial superposition of these values yielded the combined effects at p due to rotors having 1, 2, 3, and 4 blades, respectively. For example, the induced effect at p arising from the helical vortex filaments shed at $x = 0.3$ from the trailing edges of a three-bladed rotor were obtained from the sum

$$I(.3 , \theta'_p) + I(.3 , \theta'_p + 120°) + I(.3 , \theta'_p + 240°)$$

Performing the above series of calculations for each of the 108 points $p(x_p , \psi_p)$, and this in turn for each of the three values of μ yielded the "raw data" from which the final vortex sheet simulation was accomplished. The results are tabulated systematically in Table I as values of $I(x , \mu , \psi_g , x_p)$ versus number of blades.

IX. The Vortex Sheet Simulation

In this section the procedure employed in simulating the wake vortex sheet system and thus obtaining the distribution of normal component of induced velocity over the rotor blade axes is sub-divided into four principal considerations described as follows:

(1) The Root and Tip Vortices

In equation (15) giving the mean blade circulation $\overline{\Gamma}$, the constant term Γ_o gives rise to a wake vortex system consisting of two skewed, helical vortices, one of strength Γ_o shed from the blade tip, and the other of opposite strength $-\Gamma_o$ shed from the blade root, assumed here to be at $x = 0.2$. Table I gives nondimensional values of the normal component of velocity $I(x , x_p)$ induced at $p(x_p , \psi_p)$ by the vortex filaments of arbitrary positive strength shed at radius x from the trailing edges of 1, 2, 3, and 4-bladed rotors. Hence, the effects at $p(x_p , \psi_p)$ due to the root and tip vortex system, above, can

be calculated from the relation

$$\frac{4\pi R}{\Gamma_0}(V_i)_0 = I(1, x_p) - I(.2, x_p) \tag{49}$$

The results of performing this calculation over the ranges of $p(x_p, \psi_p)$ and μ are tabulated systematically versus μ, number of blades, ψ_p, and x_p in Table II-A.

(2) The Sheet of Uniform Strength

The term containing Γ_1 in equation (15) gives rise to a wake vortex system comprised of a vortex sheet of uniform total strength $-\Gamma_1$ together with a rolled-up tip vortex of strength Γ_1 and a root vortex of lumped strength $-0.2\Gamma_1$. The sheet contribution is represented by the integral

$$-(V_{pz})_1 = -\frac{\Gamma_1}{4\pi R}\int_{0.2}^{1} I(x)\,dx \tag{50}$$

contained in equation (48). Values of this integral were approximated by Simpson's Rule directly from the tabulated values of Table I for each μ and $p(x_p, \psi_p)$. The total contribution at each point p due to the above vortex system was then calculated from the relation

$$\frac{4\pi R}{\Gamma_1}(V_i)_1 = I(1, x_p) - 0.2\,I(.2, x_p) - (V_{pz})_1 \tag{51}$$

The results are tabulated versus μ, number of blades, ψ_p, and x_p in Table II-B.

(3) The Sheet of Linear Strength

The term containing Γ_2 in equation (15) results in a wake vortex

system composed of a vortex sheet for which $d\Gamma/dx = -2\Gamma_2 x$ and whose total strength is $-\Gamma_2$, together with a rolled-up tip vortex of strength Γ_2 and a root vortex of lumped strength $-.04\Gamma_2$. The sheet contribution is represented by the integral

$$-(V_{pz})_2 = -\frac{\Gamma_2}{4\pi R}\int_{.2}^{1} 2xI(x)dx \qquad (52)$$

appearing in equation (48). Simpson's Rule approximations to this integral were made directly from Table I after multiplying each ordinate by twice its corresponding abscissa. The total contributions at the points $p(x_p, \psi_p)$ arising from this system were then calculated from the relation

$$\frac{4\pi R}{\Gamma_2}(V_i)_2 = I(1, x_p) - 0.4I(.2, x_p) - (V_{pz})_2 \qquad (53)$$

The results are tabulated versus μ, number of blades, ψ_p, and x_p in Table II-C.

(4) Harmonic Analysis

As a convenience in possible future applications using the data of Table II, a 12-point harmonic analysis of each of the nondimensional induced velocities $4\pi R(V_i)_j/\Gamma_j$ $(j = 0, 1, 2)$ was carried out at each of the nine blade stations $x_p = 0.15(0.10)0.95$. The typical expansion is of the form

$$\begin{aligned}\frac{4\pi R}{\Gamma_j}(V_i)_j = {} & D_{j1}(x_p) + D_{j2}(x_p)\cos\psi + D_{j3}(x_p)\sin\psi \\ & + D_{j4}(x_p)\cos 2\psi + D_{j5}(x_p)\sin 2\psi + D_{j6}(x_p)\cos 3\psi \\ & + D_{j7}(x_p)\sin 3\psi + D_{j8}(x_p)\cos 4\psi + D_{j9}(x_p)\sin 4\psi \\ & + D_{j10}(x_p)\cos 5\psi + D_{j11}(x_p)\sin 5\psi + D_{j12}(x_p)\cos 6\psi \end{aligned} \qquad (54)$$

The harmonic coefficients $D_{jk}(x_p)(k = 1, 2, \ldots 12)$ are tabulated versus μ number of blades, x_p, and index k for $j = 0, 1, 2$ in Tables III-A, B, and C, respectively. A 12-term Fourier approximation for the superposed induced velocity distribution can be obtained from these tables by means of the relation

$$\frac{V_i}{\Omega R} \approx \frac{1}{\Omega R}\left[(V_i)_o + (V_i)_1 + (V_i)_2\right]$$
$$= \gamma_o(\text{III - A}) + \gamma_1(\text{III - B}) + \gamma_2(\text{III - C}) \qquad (55)$$

in which the γ's are given by equations (38) and the notation (III-A) designates the entry from the corresponding table. Collecting terms according to the harmonics of ψ in equation (55) then gives a finite sum of the form

$$\frac{V_i}{\Omega R} \approx \left[\gamma_o D_{01}(x_p) + \gamma_1 D_{11}(x_p) + \gamma_2 D_{21}(x_p)\right]$$
$$+ \left[\gamma_o D_{02}(x_p) + \gamma_1 D_{12}(x_p) + \gamma_2 D_{22}(x_p)\right]\cos\psi$$
$$+ \left[\gamma_o D_{03}(x_p) + \gamma_1 D_{13}(x_p) + \gamma_2 D_{23}(x_p)\right]\sin\psi$$
$$+ \ldots\ldots\ldots\ldots\ldots + \text{higher harmonics} \qquad (56)$$

which, after fitting polynomials in x to the coefficients, yields a 12-term approximation of the type assumed in equation (9)

$$\frac{V_i}{\Omega R} \approx C_o(x) + C_1(x)\cos\psi + s_1(x)\sin\psi$$
$$+ C_2(x)\cos 2\psi + s_2(x)\sin 2\psi + \ldots. \qquad (57)$$

Coefficients of particular interest, namely, the sets c_{00}, c_{01}, c_{02} and s_{10}, s_{11}, s_{12} appearing in the matrix equation (36), can then be

read from equation (57).

All computations incident to constructing the tables described above were performed on the Burroughs Datatron 220 electronic digital computer installation at the Rich Electronic Computer Center of the Georgia Institute of Technology. The programming was facilitated by the use of the Burroughs Algebraic Compiler which is a hardware representation of the problem-oriented ALGOL coding system developed through international collaboration of various computer organizations.

X. Numerical Example

As an application using the induced velocity distributions described in Section IX, the blade air loads versus blade station for fixed values of azimuth angle were calculated for a rotor system corresponding to that of the Bell HU-1A helicopter. The rotor parameters used in the computations were taken from References (3) and (4) as follows:

Gross weight	W	= 6043 lbs.
No. of blades	b	= 2
Blade chord	c	= 1.25 ft.
Blade radius	R	= 22 ft.
Flight path velocity	V	= 88.5 knots
Rotor blade tip-speed	ΩR	= 721 ft./sec.
Drag area parameter	S	= 25 ft.^{2}
Air density (at 3500 ft.)	ρ	= .002144 slugs/ft.^{3}
Sound velocity	v_s	= 1103 ft./sec.
Blade coning angle	a_o	= 4° = .0698 rad.
Blade twist angle	θ_1	= 12° = .2094 rad.

Mach number at .75 R

$$M_{.75} = \frac{.75\Omega R}{V_\infty} = 0.49$$

Blade element lift curve slope

$$a = \frac{5.75}{\sqrt{1-M_{.75}^2}} = 6.5964$$

Mean total thrust obtained by numerical integration of thrust versus azimuth angle plot in Reference (3)

$$T = 6624 \text{ lbs.}$$

Mean thrust coefficient

$$C_T = \frac{T}{\rho\pi\Omega^2R^4} = 0.0039$$

Drag force

$$D_F = \frac{1}{2}\rho V^2 S = 598.8 \text{ lbs.}$$

Angle of attack of tip-path plane

$$\alpha_r \approx \text{Tan}^{-1}\left(-\frac{D_F}{T}\right) = -0.0902$$

Tip-speed ratios

$$\mu = \frac{V\cos\alpha_r}{\Omega R} = 0.2065$$

$$V_d = \frac{V\sin\alpha_r}{\Omega R} = 0.0187$$

Plots of the harmonic coefficients $D_{jk}(x_p)$ versus $x_p = 0.25(.10).95$, as defined in equation (54) and tabulated in Tables III, indicated that the following types of least-squared polynomial approximations were practicable:

constant terms $D_{j1}(x_p) \sim$ parabolic

$\cos\psi$ coefficients $D_{j2}(x_p) \sim$ linear

$\sin\psi$ coefficients $D_{j3}(x_p) \sim$ parabolic

$\sin 2\psi$ coefficients $\begin{cases} D_{05}(x_p) \sim \text{parabolic} \\ D_{15}(x_p) \sim \text{linear} \\ D_{25}(x_p) \sim \text{linear} \end{cases}$

Accordingly, curve fitting procedures employing matrix techniques especially adapted to iterative processes were set up. Typical are the two matrix equations

$$\begin{bmatrix} c_{00} \\ c_{01} \\ c_{02} \end{bmatrix} = [M]^{-1}[D_1] \begin{bmatrix} \gamma_0 \\ \gamma_1 \\ \gamma_2 \end{bmatrix} \tag{58a}$$

$$\begin{bmatrix} s_{10} \\ s_{11} \\ s_{12} \end{bmatrix} = [M]^{-1}[D_3] \begin{bmatrix} \gamma_0 \\ \gamma_1 \\ \gamma_2 \end{bmatrix} \tag{58b}$$

in which $[M]^{-1}$ is the inverse of the matrix

$$[M] = \begin{bmatrix} 8.0 & 4.8 & 3.3 \\ 4.8 & 3.3 & 2.484 \\ 3.3 & 2.484 & 1.9825 \end{bmatrix} \tag{59a}$$

and

$$[D_1] = \begin{bmatrix} \sum D_{01} & \sum D_{11} & \sum D_{21} \\ \sum xD_{01} & \sum xD_{11} & \sum xD_{21} \\ \sum x^2D_{01} & \sum x^2D_{11} & \sum x^2D_{21} \end{bmatrix} \tag{59b}$$

$$[D_3] = \begin{bmatrix} \Sigma D_{03} & \Sigma D_{13} & \Sigma D_{23} \\ \Sigma xD_{03} & \Sigma xD_{13} & \Sigma xD_{23} \\ \Sigma x^2 D_{03} & \Sigma x^2 D_{13} & \Sigma x^2 D_{23} \end{bmatrix} \tag{59c}$$

In effect, equations (58) fit 8-point least-squares parabolas over the range $x_p = .25(.10).95$ to the constant term and the $\sin\psi$ coefficient in (56) and hence yield the parabolas $C_o(x)$ and $s_1(x)$ appearing in equation (57). Since the matrix products $[M]^{-1}[D_1]$ and $[M]^{-1}[D_3]$ need be computed only once, the technique is well adapted to an iterative process that seeks convergence of the vectors (c_{00}, c_{01}, c_{02}), (s_{10}, s_{11}, s_{12}), and $(\gamma_0, \gamma_1, \gamma_2)$.

The predicted blade air loads for the example rotor system were computed from the equation

$$\frac{dFz}{dr}\left(\frac{lb}{in}\right) = \frac{\rho \Omega R}{12}(x + \mu \sin\psi)\Gamma \tag{60}$$

in which Γ is given by a modification of equation (11) of the form

$$\Gamma = \frac{1}{2} ac\Omega R \left[\frac{V_f}{\Omega R} - \frac{V_i}{\Omega R}\right] \tag{61}$$

with the non-induced component being given by

$$\frac{V_f}{\Omega R} = f_o(x) + f_1(x)\sin\psi + f_2(x)\cos\psi$$

$$+ f_3(x)\sin 2\psi + f_4(x)\cos 2\psi \tag{62}$$

where

$$
\begin{aligned}
f_o(x) &= (v_a - \tfrac{1}{2}\mu a_1) + (A_o + \tfrac{3}{4}\theta_1)x - \theta_1 x^2 \\
f_1(x) &= \mu(A_o + \tfrac{3}{4}\theta_1) - (a_1 + \mu\theta_1)x \\
f_2(x) &= -\mu a_o + b_1 x \\
f_3(x) &= \tfrac{1}{2}\mu b_1 \\
f_4(x) &= \tfrac{1}{2}\mu a_1
\end{aligned}
\tag{63}
$$

The step-wise computational procedure employed was as follows:

(1) Equilibrium values for A_o and a_1 were approximated by permanently neglecting the matrix $[E]$ in equation (36) and then setting up an iterative cycle between equations (36), (38), and (58). The process was started by temporarily ignoring the induced terms in (36) and considering only the matrix $[B]$ as given by (37d). The iteration was continued until stable values of A_o, a_1, the vector (c_{00}, c_{01}, c_{02}), and the vector (s_{10}, s_{11}, s_{12}) were obtained.

(2) The vectors (c_{10}, c_{11}, c_{12}) and (s_{20}, s_{21}, s_{22}) corresponding to the polynomials $C_1(x)$ and $S_2(x)$ in equation (57), were then calculated using the stable vector $(\gamma_0, \gamma_1, \gamma_2)$ in a curve fitting procedure similar to (58) with modifications depending upon the nature of the fit, linear or parabolic. The equilibrium value of b_1 was then obtained from (35c).

(3) The induced velocity distribution was calculated directly from Table II using the equation

$$
\frac{V_i}{\Omega R} = \gamma_o(II - A) + \gamma_1(II - B) + \gamma_2(II - C) \tag{64}
$$

and the results tabulated versus x_p and ψ.

(4) The non-induced velocity distribution was calculated from equation (62) and tabulated as $V_f/\Omega R$ versus x_p and ψ.

(5) Using the results of steps 3 and 4, the difference

$$\frac{V_f}{\Omega R} - \frac{V_i}{\Omega R}$$

appearing in equation (61) was tabulated versus x_p and ψ.

(6) The final air load distributions were then calculated from the equation

$$\frac{dFz}{dr}\left(\frac{lb}{in}\right) = \frac{1}{24}\rho ac(\Omega R)^2(x + \mu \sin\psi)\left(\frac{V_f}{\Omega R} - \frac{V_i}{\Omega R}\right) \qquad (65)$$

using the results of step 5 and a previously calculated table of the function $(x + \mu \sin\psi)$. The results are tabulated as Air Load $(\frac{lb}{in})$ versus x_p and ψ in Table IV. A graphical comparison of the calculated air loads with the experimental values obtained from reference (3) is shown in Figures (2) and (3).

The final values of the parameters obtained from the iteration of steps 1 and 2 and used in the calculation of the final air loads are listed as follows:

$(A_o , a_1 , b_1) = (.1584 , .0616 , .0328)$ $(9.1° , 3.5° , 1.9°)$

$(\gamma_0 , \gamma_1 , \gamma_2) = (- .0006 , .0053 , - .0039)$

$(c_{00} , c_{01} , c_{02}) = (.0166 , - .0416 , .0503)$

$(s_{10} , s_{11} , s_{12}) = (- .0120 , .0780 , - .0663)$

$(s_{20} , s_{21} , s_{22}) = (.0005 , - .0322 , .0486)$

$(c_{10} , c_{11}) = (.0021 , .0108)$

DISCUSSION

Comparisons of the calculated air loads, as obtained in the foregoing example, with experimental values taken from reference (3) are given in Figures (2), (3). Figure (2) shows the air loads plotted versus nondimensional blade radius for fixed azimuth angles, while Figure (3) shows plots of the air load versus azimuth angle for certain fixed blade stations. It is seen that the agreement is poor for the early advancing blade positions $\psi = 30°$, $60°$, and $90°$. It is felt that these discrepancies arise primarily from the following sources of error:

(1) The effects of that part of the actual wake vortex system which is composed of re-entrant vortex filaments, omitted in the present analysis, would be greatest in the first quadrant reference blade positions.

(2) The induced velocities calculated by the present method are too large at the $\psi = 30°$ and $60°$ azimuth positions because of the assumption of constant strength for the skewed helical vortex filaments from which the basic data of Table I was computed. This results in calculated blade loadings which are too small.

(3) The experimental data may be too widely spaced spanwise along the reference blade to indicate the presence of local peaks in the air load distributions which may arise because of the proximity of the tip vortex shed from the preceding blade. In fact, as indicated in Figure (2), $\psi = 120°$, it is doubtful that the x, ψ - grid used in obtaining the calculated values is fine enough to delineate most of the local peaks in the existing air load distributions.

(4) The actual values of the tip speed ratio μ and wake angle χ associated with the experimental rotor system vary as much as 3% from the fixed values $\mu = 0.2$ and $\chi = \text{Tan}^{-1}(10) = 83.3°$ assumed when calculating the basic data of Table I.

The iterative procedure by which the equilibrium equations were solved for the blade angles A_o, a_o, b_1 was used in attempt to avoid the introduction of additional errors not already inherent in the initial assumptions. However, in any engineering application of the tabulated induced velocities presented here it would be feasible to calculate the blade angles by any of the accepted approximate methods and thus eliminate the tedious iteration. The labor involved in the calculation of the approximate wake circulation distribution would then be greatly reduced.

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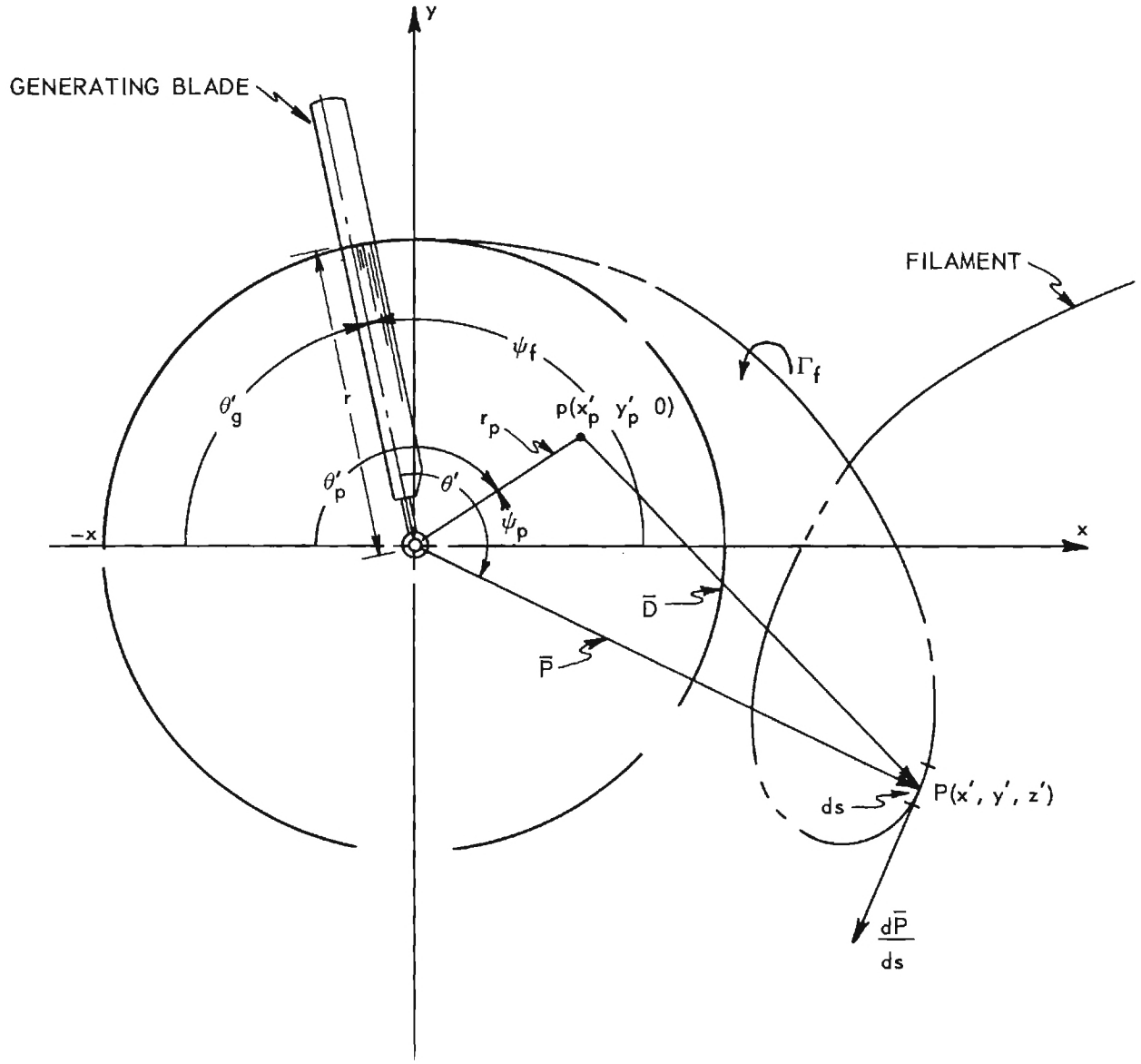

Figure (1). Projection Onto the Rotor Plane of a Wake Vortex Filament and its Associated Descriptive Parameters.

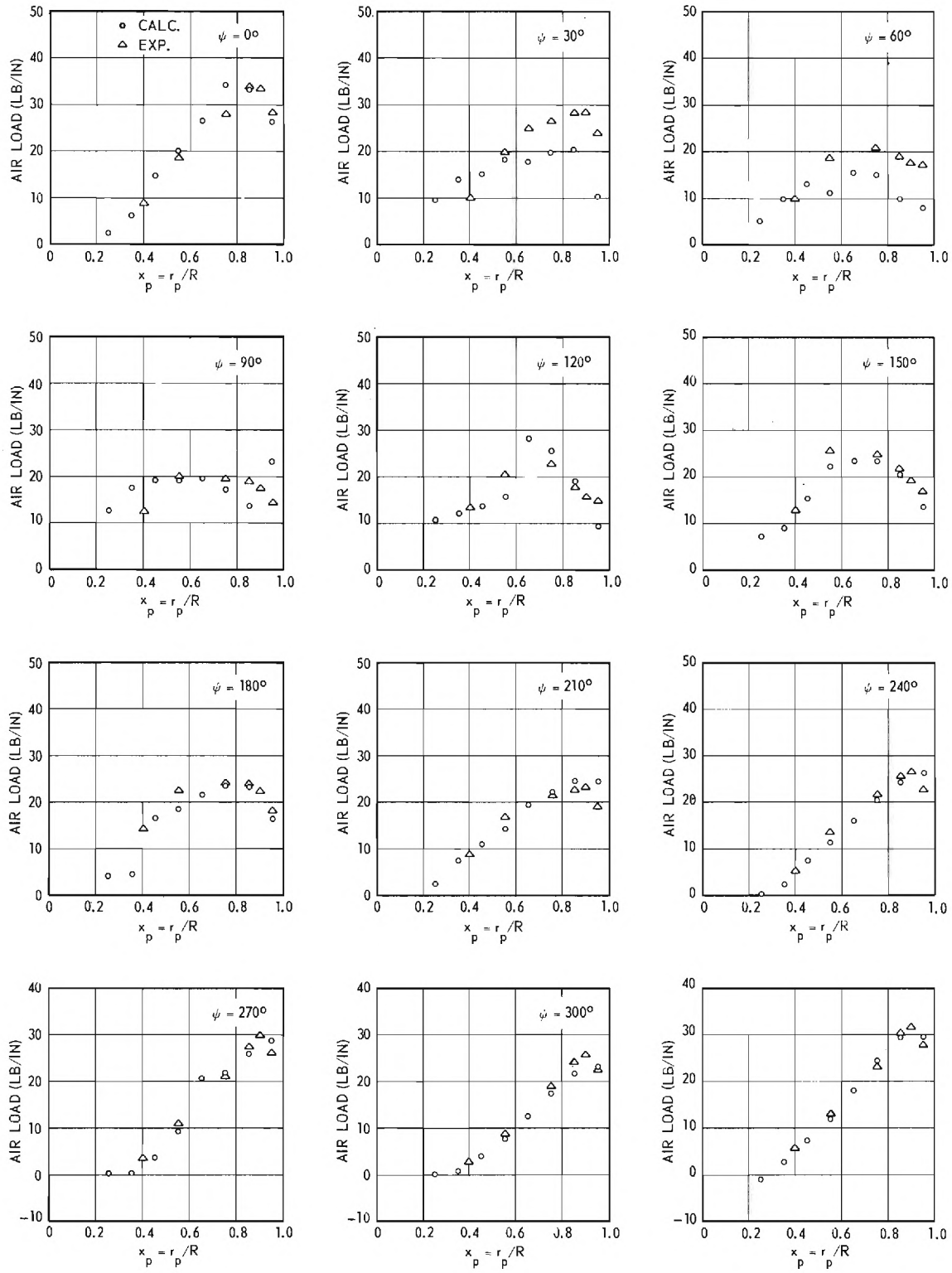

Figure (2). Air Load (lb/in) Versus x_p for Fixed ψ (V=88.5 knots, ΩR=721 ft/sec).

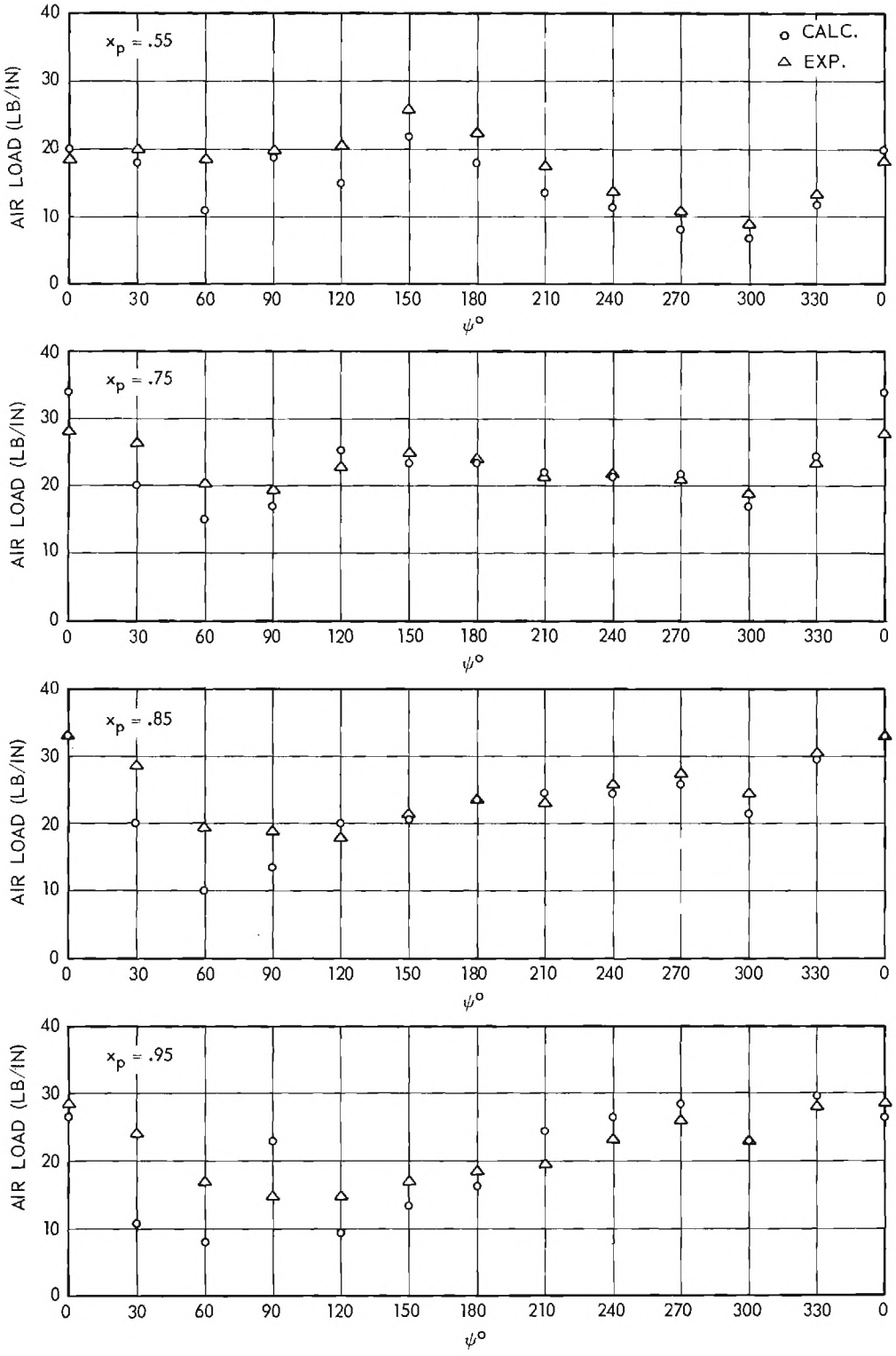

Figure (3). Air Load (lb/in) Versus ψ for Fixed x_p.

TABLE I

THE NONDIMENSIONAL NORMAL COMPONENT OF VELOCITY INDUCED AT BLADE STATION (XP,PSI) ON THE AXIS OF A REFERENCE BLADE BY SKEWED HELICAL VORTEX FILAMENTS SHED AT RADIUS X FROM THE GENERATING BLADES

MU = .2 PSI = 0 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	5.835	-50.254	-32.901	18.636	21.880	15.515	12.764	11.576	11.179
.3	-3.011	-4.814	.752	14.793	11.181	9.361	8.388	7.783	7.739
.4	-13.426	33.143	38.389	-5.066	3.238	5.146	5.481	5.437	5.386
.5	31.537	25.230	19.945	28.118	-9.157	.057	2.555	3.258	3.387
.6	22.516	16.152	13.943	14.409	26.034	-11.911	-1.706	-3.408	1.235
.7	14.577	11.818	10.693	10.616	11.938	25.396	-14.888	-3.408	-1.509
.8	10.745	9.349	8.574	8.225	8.507	9.894	24.949	-18.532	-4.598
.9	8.505	7.533	6.883	6.480	6.235	6.420	7.779	25.192	-17.381
1.0	6.826	6.058	5.440	4.900	4.404	4.054	4.983	10.575	36.441

TWO BLADES

.2	18.704	-38.363	-21.148	31.043	36.065	34.084	42.504	-9.476	-13.117
.3	5.592	3.312	8.627	22.797	19.847	19.350	21.095	30.256	-5.278
.4	-7.177	39.044	44.069	.457	8.448	9.705	9.582	24.617	47.238
.5	36.244	29.512	23.743	31.200	-7.439	-.102	13.905	28.013	31.214
.6	25.867	18.865	15.774	14.617	24.213	-3.549	18.928	12.925	21.713
.7	16.549	12.796	9.967	7.913	18.631	44.053	2.631	12.925	14.631
.8	11.087	8.074	5.279	13.731	25.889	25.824	39.213	-5.234	8.526
.9	6.592	3.789	11.465	22.946	21.043	19.163	19.608	36.356	-6.489
1.0	2.725	9.929	21.208	18.783	16.498	14.847	14.926	19.969	45.537

THREE BLADES

.2	41.153	-21.563	-4.988	50.298	73.115	-10.637	-1.011	27.501	52.405
.3	17.844	13.521	18.489	33.169	32.226	43.455	-4.909	27.227	30.452
.4	.799	45.845	50.002	4.924	10.099	35.274	65.934	-3.486	12.980
.5	41.536	33.569	25.738	29.370	10.417	36.163	37.125	48.290	-10.226
.6	28.791	19.678	12.676	29.916	55.107	12.328	21.818	28.832	53.388
.7	16.449	8.920	23.751	36.632	32.087	43.207	8.168	28.832	36.301
.8	6.616	20.703	31.963	26.067	23.470	29.047	51.632	9.915	24.539
.9	18.654	29.140	22.813	19.536	23.068	30.132	32.266	48.834	5.835
1.0	27.137	20.569	16.951	20.058	26.085	26.155	25.747	30.067	55.227

FOUR BLADES

.2	77.316	.748	15.386	82.537	2.024	17.113	56.878	22.783	17.927
.3	34.191	25.271	29.165	45.284	53.832	-5.634	39.509	48.646	13.432
.4	9.928	52.708	55.305	7.038	44.787	74.915	-22.680	30.403	56.842
.5	46.966	36.650	23.917	58.321	30.138	35.701	67.474	-23.068	31.254
.6	30.759	15.405	40.105	46.653	49.970	20.725	45.972	40.788	-39.483
.7	10.261	36.037	39.349	29.886	37.235	61.568	21.177	40.788	78.517
.8	33.985	36.232	24.954	29.635	39.820	38.916	57.607	23.286	42.893
.9	34.057	21.931	25.576	34.552	31.249	34.026	43.127	61.288	19.204
1.0	19.705	22.569	31.243	27.009	29.135	35.936	36.606	40.484	65.462

TABLE I, CONTINUED

MU = .2 PSI = 30 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	11.638	-28.643	-12.599	-9.027	-7.806	-7.171	-6.561	-5.899	-5.302
.3	2.557	11.731	-25.286	-14.712	-12.003	-11.222	-10.130	-9.182	-7.861
.4	-1.330	-1.304	7.053	-32.112	-22.044	-21.688	-16.830	-18.654	-13.159
.5	-7.659	-10.581	-19.567	28.844	5.482	14.075	15.728	16.367	.497
.6	-9.069	22.378	33.894	25.775	39.140	-2.791	10.054	13.435	14.979
.7	25.673	21.234	18.001	16.884	18.141	33.105	-9.566	4.791	7.732
.8	16.423	14.172	12.646	12.149	12.623	14.388	31.781	-14.347	1.939
.9	11.837	10.562	9.846	9.534	9.622	10.291	12.320	31.372	-18.369
1.0	9.136	8.344	7.825	7.533	7.477	7.702	8.393	10.347	31.261

TWO BLADES

.2	45.788	17.904	23.650	-37.701	-29.373	-18.952	-14.687	-11.955	-10.244
.3	17.764	28.276	-5.552	11.987	30.230	-35.930	-25.252	-18.844	-14.759
.4	8.588	9.002	18.401	-18.630	-4.279	6.377	-22.864	-42.723	-24.759
.5	-.410	-3.372	-11.813	37.460	15.530	27.398	35.060	51.521	-31.583
.6	-3.601	27.744	39.387	31.445	45.410	4.725	19.776	29.249	69.121
.7	29.707	25.071	21.690	20.482	21.947	36.925	-4.789	12.044	21.215
.8	19.147	16.517	14.660	13.867	13.957	15.667	35.094	-7.213	13.524
.9	13.181	11.206	10.017	9.722	10.754	14.582	22.298	44.970	-1.756
1.0	8.702	7.328	7.583	10.491	16.125	21.351	22.588	25.076	46.867

THREE BLADES

.2	.796	-31.297	8.427	-67.222	-39.418	-28.547	-22.183	-18.184	-15.448
.3	69.583	58.512	25.140	68.432	-110.121	-60.248	-38.179	-29.021	-22.278
.4	24.041	23.657	33.394	-.793	25.730	9.722	-12.978	-75.362	-37.291
.5	9.090	5.763	-3.078	47.096	27.373	46.526	80.384	24.148	-8.173
.6	2.772	33.544	44.717	36.492	50.466	10.875	31.905	67.902	8.980
.7	33.550	27.955	23.519	20.820	17.691	39.164	7.110	32.674	45.307
.8	20.202	15.801	12.001	13.045	29.070	37.614	55.675	11.353	32.659
.9	9.150	8.300	17.569	33.918	35.706	30.217	30.726	51.211	5.319
1.0	5.537	26.465	28.726	26.931	23.814	22.309	23.849	30.703	56.082

FOUR BLADES

.2	50.368	35.383	7.612	-79.017	-54.563	-37.957	-29.590	-24.192	-20.621
.3	-16.417	30.425	23.324	51.843	-22.622	-80.927	-50.695	-38.698	-29.790
.4	47.739	44.261	50.980	21.230	91.687	5.615	-16.974	-91.393	-50.199
.5	20.646	15.816	6.815	57.402	40.797	82.367	21.299	59.437	-31.670
.6	9.532	39.158	49.444	40.661	55.519	15.706	49.248	1.993	61.568
.7	37.115	29.860	21.093	23.709	37.414	78.083	34.533	61.295	-24.638
.8	20.694	10.484	23.120	41.959	42.551	45.164	63.275	24.423	56.297
.9	14.691	46.514	37.262	32.178	31.660	34.468	41.972	66.076	22.957
1.0	33.006	31.936	26.273	26.653	30.967	35.055	37.103	41.147	66.039

TABLE I, CONTINUED

MU = .2 PSI = 60 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	15.881	-20.304	-8.199	-5.074	-3.805	-3.094	-2.631	-2.294	-2.030
.3	5.237	16.635	-19.189	-8.123	-5.199	-3.936	-3.210	-2.739	-2.384
.4	2.356	4.667	17.066	-19.907	-8.394	-5.545	-4.257	-3.454	-2.952
.5	-.050	.891	3.283	17.083	-21.571	-8.957	-6.061	-4.729	-3.853
.6	-3.295	-3.013	-1.619	.978	16.643	-24.536	-9.792	-6.818	-5.180
.7	-11.413	-10.159	-7.815	-8.153	-3.603	15.906	-28.100	-11.136	-7.867
.8	-5.538	7.247	6.294	-9.323	-4.514	-7.938	13.755	-34.360	-12.657
.9	27.719	19.399	19.908	29.856	20.837	25.370	9.523	-3.356	-36.196
1.0	14.874	13.743	14.123	15.609	15.882	17.201	23.297	38.041	33.267
									TWO BLADES
.2	-9.550	-34.461	-17.125	-11.281	-8.333	-6.681	-5.598	-4.792	-4.193
.3	91.875	-15.721	-42.795	-19.134	-12.400	-9.038	-7.073	-5.893	-5.016
.4	22.051	32.148	49.942	-47.150	-24.314	-14.080	-9.921	-7.692	-6.316
.5	11.794	15.138	21.902	43.912	-91.411	-26.755	-15.698	-11.161	-8.611
.6	5.160	6.312	9.417	15.509	44.172	-9.768	-34.040	-18.072	-12.580
.7	-5.035	-3.309	-.265	1.112	8.726	33.114	13.506	-25.048	-22.713
.8	-.688	12.368	11.896	-2.922	3.272	2.066	27.725	-15.550	-37.637
.9	31.240	23.048	23.815	34.238	25.872	31.732	17.787	8.709	-9.327
1.0	17.094	15.975	16.433	18.226	19.015	21.072	28.234	45.023	44.677
									THREE BLADES
.2	73.052	-60.665	-27.768	-17.313	-12.764	-10.118	-8.420	-7.200	-6.293
.3	10.799	42.564	-52.308	-30.843	-19.010	-13.686	-10.729	-8.823	-7.531
.4	-6.567	-9.483	25.852	4.524	-39.146	-21.760	-15.160	-11.653	-9.563
.5	34.845	60.133	45.571	10.992	-.758	-58.246	-24.599	-16.852	-12.895
.6	17.571	20.689	25.438	45.551	48.961	46.026	-47.785	-27.913	-18.785
.7	2.896	5.270	9.539	13.419	23.387	57.386	-5.303	-57.220	-30.817
.8	4.697	17.781	17.821	4.258	12.050	13.657	50.370	28.778	-76.757
.9	34.492	26.333	27.490	38.753	31.428	38.599	27.916	25.851	4.928
1.0	18.400	16.943	17.976	20.646	21.998	24.294	32.927	52.845	54.619
									FOUR BLADES
.2	20.567	-141.051	-37.159	-23.100	-16.926	-13.440	-11.224	-9.608	-8.398
.3	100.483	8.687	-51.489	-41.277	-25.470	-18.113	-14.283	-11.812	-10.051
.4	19.071	33.500	63.159	7.720	-51.801	-28.929	-20.151	-15.575	-12.703
.5	9.859	-.332	14.825	43.413	-77.226	-69.046	-32.687	-22.524	-17.177
.6	37.093	36.790	40.550	54.439	42.682	68.219	-89.729	-37.379	-25.292
.7	12.450	14.642	20.605	27.606	41.821	60.892	70.449	-67.868	-43.571
.8	9.995	23.269	23.996	11.347	20.671	27.518	83.403	20.498	-73.066
.9	36.517	28.449	29.091	39.684	34.552	45.182	38.482	37.877	37.684
1.0	16.998	14.729	15.923	8.620	22.949	27.260	38.922	59.351	68.719

TABLE I, CONTINUED

MU = .2 PSI = 90 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	19.633	-16.412	-5.774	-3.435	-2.432	-1.911	-1.587	-1.360	-1.183
.3	7.521	19.526	-16.768	-5.790	-3.461	-2.479	-1.964	-1.620	-1.381
.4	4.257	7.185	19.849	-17.846	-5.881	-3.518	-2.569	-2.042	-1.681
.5	2.347	3.863	6.710	20.550	-19.384	-6.004	-3.730	-2.692	-2.137
.6	.767	1.753	3.313	6.115	21.534	-21.232	-6.111	-3.929	-2.851
.7	-1.276	-.204	1.034	2.670	5.577	22.688	-23.279	-6.315	-4.109
.8	-4.474	-2.858	-1.513	.046	1.852	4.981	24.109	-25.476	-6.481
.9	-9.325	-7.079	-6.116	-3.342	-.846	1.333	4.373	25.562	-27.770
1.0	15.786	-1.387	-21.447	-10.022	-4.134	-1.783	.307	3.652	27.149

TWO BLADES

.2	12.502	-21.205	-9.251	-6.107	-4.596	-3.710	-3.118	-2.691	-2.355
.3	-6.403	11.820	-21.802	-9.408	-6.214	-4.694	-3.801	-3.181	-2.735
.4	-93.375	-8.971	11.038	-23.369	-9.769	-6.460	-4.911	-3.971	-3.310
.5	30.479	40.096	-17.019	9.784	-25.520	-10.094	-6.899	-5.188	-4.185
.6	15.330	22.275	75.648	-21.492	10.525	-27.883	-10.688	-7.264	-5.528
.7	8.663	12.218	20.375	28.288	-22.215	10.694	-30.668	-11.319	-7.780
.8	2.934	5.857	9.561	15.248	29.185	-8.445	10.629	-33.902	-11.952
.9	-3.646	-.589	1.592	6.379	12.221	20.561	3.657	3.054	-37.646
1.0	20.097	3.483	-15.756	-3.144	4.166	10.219	20.849	24.409	-5.267

THREE BLADES

.2	-8.123	-28.978	-13.653	-9.153	-6.892	-5.569	-4.680	-4.034	-3.540
.3	50.845	-17.129	-29.733	-13.910	-9.323	-7.049	-5.695	-4.771	-4.099
.4	17.559	38.702	-13.906	-31.826	-14.568	-9.710	-7.360	-5.944	-4.967
.5	.077	11.417	35.147	-8.680	-35.712	-15.301	-10.295	-7.808	-6.284
.6	18.541	-22.676	7.501	34.710	-96.981	-39.100	-16.120	-10.982	-8.298
.7	27.872	39.028	-10.042	4.358	42.833	-9.870	-40.332	-16.823	-11.599
.8	13.359	19.071	27.940	19.345	-21.277	18.458	9.969	-42.841	-17.480
.9	3.223	7.382	11.773	22.059	77.879	-1.518	12.160	-1.640	-47.018
1.0	24.692	8.690	-9.025	5.937	19.408	25.585	4.998	10.725	-94.070

FOUR BLADES

.2	-27.621	-38.342	-18.150	-12.166	-9.201	-7.426	-6.242	-5.381	-4.720
.3	21.069	-39.095	-38.600	-18.538	-12.328	-9.395	-7.593	-6.354	-5.467
.4	-83.007	12.776	-77.586	-40.739	-19.419	-12.992	-9.822	-7.933	-6.629
.5	32.837	48.285	1.824	8.338	-44.756	-20.519	-13.826	-10.417	-8.379
.6	2.878	21.822	81.502	-4.799	16.264	-54.096	-21.938	-14.594	-11.086
.7	33.217	-2.987	15.803	30.582	-4.194	281.712	-60.061	-23.214	-15.602
.8	26.713	37.061	19.401	-10.177	30.077	10.807	73.480	-59.236	-24.239
.9	10.823	16.727	27.673	54.485	11.567	19.360	19.161	12.000	-57.837
1.0	29.467	14.687	-.972	17.754	26.238	7.186	19.685	33.259	-4.413

TABLE I, CONTINUED

MU = .2 PSI = 120 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	24.073	-13.356	-4.067	-2.332	-1.622	-1.240	-1.007	-.847	-.732
.3	9.953	22.009	-14.574	-4.288	-2.466	-1.707	-1.298	-1.053	-.883
.4	5.899	9.390	21.327	-16.039	-4.482	-2.614	-1.811	-1.369	-1.115
.5	3.933	5.570	8.783	21.638	-17.595	-4.641	-2.758	-1.926	-1.457
.6	2.508	3.602	5.186	8.247	22.450	-19.591	-4.834	-2.899	-1.999
.7	1.255	2.150	3.245	4.843	7.696	23.675	-21.577	-4.982	-3.020
.8	-.248	.792	1.789	2.897	4.505	7.241	25.086	-23.666	-5.142
.9	-2.447	-.688	.306	1.410	2.580	4.184	6.843	26.731	-25.819
1.0	-6.243	-3.805	-1.621	-.113	1.081	2.093	3.876	6.452	28.455

TWO BLADES

.2	20.996	-15.590	-5.775	-3.703	-2.756	-2.203	-1.837	-1.580	-1.383
.3	5.262	18.918	-16.798	-6.004	-3.847	-2.854	-2.269	-1.894	-1.617
.4	-3.010	4.417	18.210	-18.381	-6.297	-4.070	-3.017	-2.392	-1.989
.5	-29.232	-3.950	3.483	18.153	-20.099	-6.579	-4.313	-3.210	-2.544
.6	33.432	-19.747	-4.563	2.560	18.696	-22.280	-6.907	-4.557	-3.373
.7	18.691	36.592	-12.505	-6.382	1.482	19.733	-24.452	-7.194	-4.791
.8	11.118	16.643	24.880	-27.465	-8.966	.557	20.933	-26.703	-7.468
.9	5.917	9.911	15.959	44.522	-91.264	-10.280	-.003	22.322	-29.016
1.0	.187	3.772	8.483	15.850	44.689	-16.541	-7.963	-.344	23.908

THREE BLADES

.2	14.061	-19.123	-8.077	-5.375	-4.060	-3.271	-2.741	-2.357	-2.069
.3	-12.685	12.596	-20.243	-8.237	-5.535	-4.178	-3.356	-2.815	-2.418
.4	67.734	-11.602	11.640	-21.949	-8.675	-5.835	-4.406	-3.529	-2.956
.5	20.137	61.589	-19.678	11.463	-23.815	-9.081	-6.171	-4.678	-3.742
.6	5.887	20.509	83.130	-14.605	12.102	-25.928	-9.515	-6.527	-4.927
.7	-28.002	3.278	17.880	18.172	-10.774	13.298	-28.202	-9.922	-6.862
.8	55.929	-2.414	2.945	14.678	32.083	-15.565	14.494	-30.756	-10.347
.9	20.026	26.093	-13.253	1.037	12.911	98.870	-16.691	15.802	-33.225
1.0	8.578	15.077	27.710	4.551	-.071	10.738	31.931	-12.276	17.253

FOUR BLADES

.2	1.963	-23.406	-10.511	-7.063	-5.398	-4.349	-3.646	-3.142	-2.751
.3	12.552	2.978	-24.384	-10.762	-7.306	-5.547	-4.466	-3.747	-3.217
.4	20.037	-13.277	3.131	-26.113	-11.246	-7.665	-5.830	-4.684	-3.927
.5	-17.759	19.226	-9.345	.641	-28.207	-11.636	-8.121	-6.188	-4.978
.6	38.487	-9.005	22.091	-294.788	-.551	-30.760	-12.179	-8.577	-6.534
.7	17.377	40.467	-2.532	21.912	-45.779	1.654	-33.185	-12.928	-9.019
.8	.783	14.033	27.735	-18.252	14.363	-7.203	5.206	-35.549	-13.431
.9	37.756	6.274	10.154	45.517	-83.095	7.219	-4.295	8.066	-37.938
1.0	17.914	25.944	4.273	1.199	44.727	-9.370	6.251	-5.972	9.820

TABLE I, CONTINUED

MU = .2 PSI = 150 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	33.401	-10.106	-2.693	-1.456	-.970	-.715	-.566	-.465	-.394
.3	12.987	26.067	-11.928	-3.089	-1.673	-1.069	-.815	-.636	-.521
.4	7.747	11.861	23.122	-13.706	-3.433	-1.879	-1.249	-.916	-.717
.5	5.357	7.085	10.933	22.255	-15.545	-3.716	-2.063	-1.385	-1.018
.6	3.878	4.913	6.609	10.107	22.479	-17.469	-3.959	-2.241	-1.509
.7	2.689	3.486	4.526	6.187	9.371	23.355	-19.457	-4.181	-2.394
.8	1.535	2.331	3.140	4.198	5.739	8.727	24.576	-21.544	-4.370
.9	.243	1.216	2.038	2.870	3.917	5.493	8.174	26.078	-23.674
1.0	-1.649	-.100	.936	1.757	2.606	3.644	5.182	7.713	27.747

TWO BLADES

.2	32.179	-11.039	-3.432	-2.061	-1.480	-1.152	-.949	-.806	-.695
.3	11.076	24.729	-12.950	-3.894	-2.329	-1.614	-1.288	-1.045	-.885
.4	4.265	9.660	21.586	-14.860	-4.340	-2.616	-1.864	-1.445	-1.169
.5	-1.699	3.299	8.509	20.550	-16.837	-4.733	-2.896	-2.074	-1.605
.6	-12.937	-2.211	2.706	7.523	20.601	-18.890	-5.081	-3.157	-2.273
.7	22.677	-11.147	-2.544	1.996	6.564	21.336	-21.005	-5.414	-3.404
.8	20.599	43.357	-12.555	-2.946	1.374	5.820	22.405	-23.215	-5.705
.9	12.522	19.665	27.780	-11.112	-3.379	1.022	5.090	23.776	-25.457
1.0	7.315	11.722	18.539	12.409	-9.406	-3.987	.411	4.424	25.341

THREE BLADES

.2	29.258	-12.718	-4.561	-2.892	-2.122	-1.685	-1.394	-1.192	-1.037
.3	5.199	21.991	-14.676	-5.077	-3.226	-2.323	-1.858	-1.533	-1.301
.4	-11.697	4.110	18.672	-16.643	-5.631	-3.597	-2.623	-2.076	-1.709
.5	69.484	-10.233	3.002	17.511	-18.815	-6.137	-3.956	-2.933	-2.305
.6	21.526	27.942	-9.918	1.941	17.435	-20.927	-6.609	-4.321	-3.205
.7	8.784	20.973	13.659	-10.676	.731	17.980	-23.239	-7.044	-4.660
.8	-4.434	8.159	20.729	13.345	-13.626	-.438	18.934	-25.575	-7.425
.9	19.194	-1.009	7.936	23.707	17.925	-17.799	-1.558	20.096	-27.948
1.0	21.589	20.170	-4.079	7.466	26.152	29.145	-22.157	-2.604	21.463

FOUR BLADES

.2	24.730	-14.830	-5.849	-3.795	-2.819	-2.237	-1.859	-1.587	-1.374
.3	-8.573	17.717	-16.765	-6.426	-4.189	-3.070	-2.463	-2.034	-1.732
.4	108.648	-9.712	14.511	-18.912	-7.113	-4.664	-3.460	-2.752	-2.257
.5	20.457	17.990	-7.957	13.257	-21.178	-7.737	-5.143	-3.837	-3.046
.6	-1.178	18.980	10.010	-7.000	13.174	-23.492	-8.307	-5.568	-4.200
.7	28.996	-.043	17.874	-3.147	-7.918	13.794	-25.846	-8.855	-6.024
.8	21.722	48.966	-2.096	17.210	-68.530	-9.019	14.732	-28.261	-9.360
.9	7.277	19.897	32.569	-1.290	16.317	-42.247	-9.836	15.957	-30.486
1.0	20.770	4.546	17.579	16.687	-.258	13.720	-14.587	-10.137	17.350

TABLE I, CONTINUED

MU = .2 PSI = 180 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	60.090	-6.547	-1.450	-.672	-.379	-.253	-.176	-.130	-.098
.3	16.514	36.252	-8.744	-2.030	-.982	-.570	-.392	-.279	-.209
.4	9.902	14.601	27.410	-11.038	-2.520	-1.259	-.753	-.526	-.383
.5	6.871	8.675	13.142	23.876	-13.013	-2.924	-1.503	-.918	-.656
.6	5.135	6.107	7.914	11.884	22.815	-14.993	-3.230	-1.723	-1.072
.7	3.865	4.577	5.556	7.318	10.879	22.928	-17.012	-3.548	-1.913
.8	2.767	3.393	4.132	4.884	6.824	10.092	23.731	-19.082	-3.801
.9	1.736	2.392	3.026	3.771	4.727	6.418	9.344	24.835	-21.203
1.0	.575	1.393	2.074	2.731	3.411	4.200	6.043	8.716	26.401

TWO BLADES

.2	60.094	-6.569	-1.481	-.706	-.412	-.279	-.202	-.151	-.121
.3	16.020	35.902	-9.002	-2.226	-1.132	-.693	-.493	-.362	-.281
.4	8.462	13.694	26.780	-11.498	-2.875	-1.540	-.974	-.703	-.532
.5	3.808	6.817	11.915	23.016	-13.656	-3.422	-1.893	-1.232	-.915
.6	-1.387	2.628	5.731	10.403	21.758	-15.803	-3.853	-2.218	-1.479
.7	-10.544	-2.233	1.761	4.869	9.193	21.696	-17.958	-4.292	-2.509
.8	39.026	-11.628	-2.872	.987	4.147	8.214	22.341	-20.157	-4.657
.9	20.256	41.307	-12.790	-3.369	.492	3.649	7.299	23.303	-22.405
1.0	12.898	19.161	43.766	-14.021	-3.841	-.199	3.012	6.526	24.743

THREE BLADES

.2	59.378	-7.016	-1.756	-.891	-.541	-.383	-.277	-.215	-.169
.3	13.787	34.741	-9.695	-2.689	-1.455	-.931	-.680	-.507	-.395
.4	2.769	11.145	25.365	-12.419	-3.495	-1.995	-1.317	-.977	-.746
.5	-11.822	.819	9.010	21.342	-14.769	-4.191	-2.473	-1.685	-1.271
.6	50.522	-13.019	-.452	7.242	19.829	-17.095	-4.781	-2.925	-2.019
.7	20.571	53.503	-14.562	-1.406	5.796	19.586	-19.377	-5.351	-3.317
.8	9.558	18.642	56.813	-16.531	-2.216	4.649	20.058	-21.718	-5.833
.9	-1.064	8.292	17.221	60.882	-18.199	-2.850	3.576	20.873	-24.120
1.0	26.321	-2.508	7.315	15.901	65.157	-20.411	-3.448	2.684	22.280

FOUR BLADES

.2	57.777	-7.631	-2.144	-1.133	-.710	-.497	-.369	-.284	-.228
.3	9.235	32.890	-10.611	-3.270	-1.841	-1.208	-.885	-.667	-.518
.4	-16.964	6.317	23.200	-13.565	-4.273	-2.521	-1.709	-1.269	-.981
.5	77.015	-22.045	3.881	18.969	-16.085	-5.121	-3.134	-2.179	-1.661
.6	18.579	85.366	-27.390	1.687	17.190	-18.589	-5.868	-3.707	-2.630
.7	.879	16.817	94.788	-32.779	-.184	16.727	-21.052	-6.564	-4.220
.8	45.482	-1.218	15.531	104.778	-38.259	-1.864	17.036	-23.479	-7.184
.9	21.115	46.814	-3.281	14.861	115.396	-43.655	-3.462	17.643	-26.055
1.0	-.372	19.077	48.525	-4.961	14.362	126.039	-49.291	-4.991	18.716

TABLE I, CONTINUED

MU = .2 PSI = 210 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	103.100	-2.925	.200	.103	.188	.209	.210	.203	.193
.3	22.952	58.738	-6.083	-1.041	-.321	-.084	.018	.068	.091
.4	12.754	17.046	36.952	-8.570	-1.717	-.697	-.334	-.161	-.068
.5	8.726	10.517	14.912	28.097	-10.716	-2.268	-1.026	-.556	-.325
.6	6.485	7.375	9.100	13.335	24.525	-12.582	-2.714	-1.306	-.720
.7	4.995	5.539	6.539	8.231	11.871	23.302	-14.726	-3.082	-1.557
.8	3.841	4.296	4.956	5.805	7.556	11.100	23.334	-16.775	-3.381
.9	2.816	3.277	3.785	4.443	5.386	6.949	10.221	24.029	-18.865
1.0	1.800	2.310	2.798	3.340	4.018	4.740	6.458	9.471	25.210

TWO BLADES

.2	104.183	-2.145	-.228	.596	.602	.563	.516	.476	.440
.3	23.486	59.167	-5.720	-.728	-.043	.161	.239	.277	.283
.4	12.527	16.961	36.951	-8.518	-1.640	-.609	-.230	-.056	.035
.5	7.332	9.658	14.378	27.749	-10.927	-2.398	-1.094	-.585	-.328
.6	3.122	5.283	7.772	12.433	23.912	-13.008	-3.020	-1.526	-.869
.7	-2.524	1.208	3.846	6.483	10.660	22.443	-15.348	-3.551	-1.906
.8	-7.893	-4.486	-.148	2.603	5.434	9.623	22.262	-17.576	-3.998
.9	26.994	-12.749	-6.282	-1.266	1.710	4.499	8.502	22.761	-19.832
1.0	19.090	23.539	-19.247	-7.385	-2.622	.775	3.716	7.524	23.759

THREE BLADES

.2	104.986	-1.561	.375	1.002	.948	.869	.793	.724	.671
.3	23.193	59.149	-5.626	-.579	.121	.342	.420	.443	.446
.4	10.250	15.835	36.387	-8.799	-1.775	-.636	-.213	-.008	.101
.5	.581	6.294	12.638	26.780	-11.509	-2.743	-1.327	-.724	-.407
.6	-15.080	-3.565	3.528	10.234	22.574	-13.862	-3.582	-1.903	-1.151
.7	32.488	-29.784	-6.924	1.276	7.948	20.905	-16.430	-4.286	-2.453
.8	17.687	27.021	6.821	-10.871	-.657	6.498	20.382	-18.847	-4.919
.9	7.558	14.158	23.233	12.903	-16.811	-2.526	5.006	20.620	-21.300
1.0	.292	5.255	11.648	19.871	18.852	-26.534	-4.252	3.687	21.398

FOUR BLADES

.2	105.460	-1.076	.857	1.363	1.277	1.167	1.062	.973	.894
.3	21.819	58.709	-5.713	-.546	.242	.477	.567	.597	.598
.4	3.913	13.418	35.378	-9.292	-2.006	-.746	-.241	.000	.145
.5	-72.769	-1.988	9.420	25.243	-12.344	-3.236	-1.614	-.895	-.512
.6	35.401	-18.683	-5.752	6.382	20.628	-14.952	-4.286	-2.374	-1.461
.7	13.953	31.588	17.771	-8.967	3.722	18.521	-17.802	-5.169	-3.072
.8	2.053	9.859	24.640	21.615	-13.044	1.933	17.791	-20.435	-5.986
.9	32.478	-4.232	6.254	18.960	37.489	-17.209	.236	17.924	-23.065
1.0	19.328	27.345	-12.204	3.785	14.780	63.953	-19.167	-1.295	18.330

TABLE I, CONTINUED

MU = .2 PSI = 240 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	150.786	.726	1.097	.957	.824	.720	.637	.577	.525
.3	31.710	60.963	-3.958	-.076	.359	.445	.462	.445	.424
.4	16.313	20.162	42.086	-7.125	-1.047	-.149	.102	.208	.255
.5	10.860	12.049	15.980	32.089	-9.421	-1.798	-.604	-.194	-.015
.6	7.963	8.667	10.115	13.779	26.638	-11.375	-2.400	-.991	-.471
.7	6.187	6.596	7.316	8.790	12.356	24.225	-13.300	-2.867	-1.314
.8	4.855	5.131	5.606	6.275	7.859	11.162	23.508	-15.236	-3.247
.9	3.747	3.998	4.363	4.898	5.729	7.214	10.376	23.425	-17.271
1.0	2.699	2.959	3.301	3.731	4.314	5.174	6.654	9.596	24.522

TWO BLADES

.2	152.946	2.348	2.383	2.014	1.719	1.495	1.316	1.184	1.073
.3	33.204	62.138	-2.987	.750	1.076	1.081	1.032	.972	.898
.4	17.034	20.773	42.634	-6.625	-.579	.288	.516	.596	.629
.5	10.545	11.870	15.927	32.127	-9.312	-1.639	-.413	.013	.209
.6	6.024	7.275	9.162	13.162	26.241	-11.613	-2.516	-1.021	-.448
.7	.986	3.095	4.877	7.094	11.198	23.425	-13.851	-3.240	-1.555
.8	-12.263	-2.829	.497	2.821	5.456	9.509	22.361	-16.064	-3.846
.9	20.309	-9.230	-6.566	-2.179	1.020	4.080	8.258	21.921	-18.365
1.0	24.975	34.283	9.416	-9.781	-5.886	-1.165	2.982	7.061	22.697

THREE BLADES

.2	155.094	3.993	3.665	3.060	2.602	2.258	1.988	1.782	1.614
.3	34.374	63.129	-2.153	1.479	1.739	1.680	1.579	1.460	1.357
.4	16.603	20.629	42.718	-6.412	-.285	.620	.868	.940	.960
.5	6.844	9.612	14.668	31.498	-9.584	-1.707	-.367	.131	.376
.6	-8.878	.325	5.000	10.941	24.974	-12.312	-2.910	-1.219	-.529
.7	74.345	-11.591	-6.701	.395	7.954	21.611	-14.954	-3.901	-1.986
.8	25.400	28.950	26.315	-28.327	-3.201	5.512	20.020	-17.518	-4.780
.9	12.338	16.841	22.361	35.948	-57.027	-5.239	3.541	19.141	-20.138
1.0	-.186	5.763	11.701	17.931	43.554	3.866	-7.477	1.710	19.505

FOUR BLADES

.2	157.511	5.636	4.939	4.091	3.472	3.015	2.652	2.374	2.156
.3	34.971	63.777	-1.458	2.154	2.372	2.253	2.104	1.963	1.818
.4	14.024	19.501	42.326	-6.334	-.067	.908	1.192	1.270	1.291
.5	-6.764	3.117	11.807	30.209	-10.149	-1.898	-.377	.227	.519
.6	43.663	-55.432	-5.164	6.402	22.838	-13.319	-3.438	-1.490	-.648
.7	22.139	36.066	31.915	-12.705	.816	18.704	-16.317	-4.760	-2.496
.8	.991	13.212	22.522	40.558	-10.309	-5.478	16.410	-19.380	-5.917
.9	28.509	.778	6.090	14.715	26.131	-43.416	-10.473	14.980	-22.326
1.0	28.841	39.874	16.978	.477	8.432	25.877	52.073	-10.899	15.032

TABLE I, CONTINUED

MU = .2 PSI = 270 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-76.395	5.064	2.741	2.019	1.628	1.380	1.202	1.061	.958
.3	45.474	54.467	-3.823	.813	1.090	1.062	.985	.906	.825
.4	20.773	21.190	35.884	-8.102	-.635	.336	.575	.628	.622
.5	13.237	13.404	15.883	29.408	-10.129	-1.676	-.297	.144	.299
.6	9.657	9.581	10.463	13.290	25.787	-11.546	-2.455	-.814	-.214
.7	7.466	7.402	7.828	8.939	11.738	23.934	-12.870	-3.015	-1.261
.8	5.908	5.885	6.076	6.541	7.764	10.675	23.302	-14.900	-3.496
.9	4.658	4.618	4.749	5.079	5.566	6.954	9.755	23.438	-16.895
1.0	3.524	3.505	3.591	3.819	4.236	4.907	6.237	8.954	24.098

TWO BLADES

.2	-72.988	7.719	4.890	3.814	3.162	2.712	2.380	2.109	1.907
.3	48.002	56.494	-2.134	2.257	2.349	2.178	1.982	1.818	1.652
.4	22.431	22.510	36.988	-7.142	.226	1.134	1.319	1.317	1.282
.5	13.848	13.788	16.169	29.669	-9.835	-1.346	.058	.536	.710
.6	8.975	8.578	9.582	12.484	25.185	-11.916	-2.651	-.869	-.154
.7	4.150	3.832	4.615	6.341	9.608	22.377	-13.947	-3.738	-1.717
.8	-1.800	-4.088	-2.204	.363	2.594	6.908	20.721	-16.690	-4.748
.9	-6.826	-1.104	-13.911	-8.820	-5.493	-2.973	4.207	19.801	-19.407
1.0	25.041	24.582	38.345	25.717	13.651	-34.250	-5.396	1.758	19.287

THREE BLADES

.2	-69.029	10.617	7.184	5.687	4.731	4.071	3.569	3.170	2.861
.3	50.661	58.533	-.479	3.661	3.585	3.275	2.966	2.718	2.495
.4	23.555	23.223	37.548	-6.535	.868	1.810	1.998	1.991	1.929
.5	12.184	11.987	14.625	28.691	-10.262	-1.425	.230	.826	1.063
.6	.772	-.182	3.085	7.583	22.455	-13.411	-3.377	-1.148	-.227
.7	9.086	-5.634	-11.876	-17.050	.473	17.700	-16.478	-5.118	-2.454
.8	28.304	33.260	30.929	37.025	13.582	-8.204	13.389	-20.465	-6.740
.9	16.725	16.874	17.846	20.918	30.084	39.662	-.980	6.216	-24.240
1.0	8.320	7.551	6.377	10.014	14.077	18.887	27.759	6.400	.716

FOUR BLADES

.2	-64.683	13.693	9.516	7.569	6.318	5.423	4.756	4.223	3.816
.3	53.146	60.366	1.056	4.996	4.796	4.377	3.968	3.627	3.314
.4	23.244	22.656	37.320	-6.334	1.378	2.469	2.665	2.657	2.573
.5	6.440	3.713	9.783	25.939	-11.347	-1.578	.333	1.135	1.428
.6	23.198	22.815	2.670	-5.075	16.099	-15.693	-4.321	-1.463	-.305
.7	32.636	29.218	37.883	43.770	-50.239	9.130	-19.927	-6.743	-3.292
.8	14.355	11.824	15.104	20.271	33.841	32.927	1.660	-25.263	-8.996
.9	3.634	9.328	-2.884	3.551	9.700	18.483	46.148	3.363	-31.279
1.0	30.922	30.284	44.682	33.110	22.456	-22.655	10.916	27.580	-26.517

TABLE I, CONTINUED

MU = .2 PSI = 300 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-26.812	13.662	5.440	3.666	2.866	2.396	2.075	1.838	1.650
.3	52.977	17.708	-10.967	1.549	1.993	1.909	1.727	1.580	1.444
.4	27.374	21.755	29.041	-12.859	-.651	.808	1.111	1.140	1.113
.5	16.270	14.293	15.161	25.202	-12.414	-2.008	-.099	.432	.636
.6	11.520	10.502	10.715	12.504	23.489	-12.785	-2.957	-.859	-.181
.7	8.838	8.196	8.162	8.805	10.815	22.818	-13.996	-3.705	-1.523
.8	7.028	6.590	6.427	6.661	7.423	9.666	22.618	-15.852	-4.364
.9	5.601	5.243	5.033	5.018	5.362	6.216	8.476	22.757	-18.145
1.0	4.394	4.017	3.776	3.674	3.736	4.033	4.906	7.236	23.110

TWO BLADES

.2	-21.690	17.797	8.901	6.630	5.447	4.665	4.088	3.641	3.284
.3	56.786	20.891	-8.263	3.876	4.029	3.719	3.361	3.068	2.818
.4	30.121	23.985	30.832	-11.408	.564	1.872	2.099	2.112	2.049
.5	17.904	15.416	15.710	25.309	-12.514	-2.299	-.262	.451	.834
.6	11.843	10.035	9.285	10.194	20.704	-15.780	-5.484	-2.701	-1.326
.7	6.985	4.879	2.907	.358	2.712	12.717	-21.993	-9.595	-5.549
.8	.262	-2.069	-3.810	-9.616	13.647	18.303	20.137	-28.189	-18.127
.9	-15.340	11.385	29.367	31.071	28.019	28.144	35.288	49.126	3.352
1.0	30.561	27.135	20.974	19.743	18.822	18.909	20.803	24.412	45.471

THREE BLADES

.2	-15.347	22.619	12.782	9.852	8.155	6.992	6.135	5.462	4.903
.3	61.185	24.135	-5.578	6.147	6.004	5.486	5.011	4.565	4.213
.4	32.739	25.651	31.614	-11.296	.647	2.298	2.875	3.022	3.054
.5	18.153	13.863	12.037	20.066	-17.908	-5.713	-1.681	.186	1.090
.6	7.210	2.097	-14.733	7.206	8.958	-26.924	-14.979	-5.883	-2.536
.7	-18.797	29.598	41.143	36.063	40.290	53.824	31.812	-22.396	-10.763
.8	44.444	27.504	23.693	21.550	21.371	24.958	42.951	14.177	-22.020
.9	21.661	16.705	13.718	11.383	6.684	11.383	15.389	28.908	3.159
1.0	10.971	5.469	6.767	9.743	16.442	25.092	30.141	32.314	39.427

FOUR BLADES

.2	-7.982	27.843	16.817	13.106	10.870	9.332	8.175	7.280	6.563
.3	65.894	26.805	-3.120	8.067	7.816	7.255	6.653	6.089	5.614
.4	34.744	25.767	29.732	-13.795	-.427	2.617	3.736	4.035	4.027
.5	15.354	6.101	-.428	18.117	-29.658	-11.835	-2.696	.208	1.400
.6	4.255	62.373	44.065	44.175	61.254	27.629	-23.671	-8.079	-3.374
.7	37.588	30.149	24.100	20.575	23.919	38.307	20.784	-36.120	-14.134
.8	19.404	13.937	10.477	3.895	27.162	33.349	39.448	3.588	-34.782
.9	-2.228	22.620	39.272	40.137	36.711	36.586	44.152	62.564	29.680
1.0	39.714	34.683	27.159	24.884	24.049	23.035	18.311	27.029	53.545

TABLE I, CONTINUED

MU = .2 PSI = 330 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-3.953	-106.184	14.311	7.664	5.650	4.605	3.970	3.551	3.236
.3	-23.434	53.813	-16.291	2.572	3.648	3.460	3.203	2.929	2.707
.4	41.024	25.048	27.960	-13.694	-.632	1.634	2.063	2.091	1.995
.5	21.975	16.239	15.544	23.999	-12.457	-2.211	.333	.905	1.042
.6	14.349	11.984	11.261	12.431	23.266	-13.180	-3.416	-1.000	-.446
.7	10.762	9.377	8.864	9.046	10.591	22.762	-15.087	-4.725	-2.626
.8	8.440	7.540	7.059	6.936	7.309	8.926	22.383	-18.074	-6.197
.9	6.776	6.067	5.573	5.253	5.105	5.296	6.795	22.149	-19.221
1.0	5.417	4.785	4.237	3.761	3.225	2.819	3.370	8.505	31.581

TWO BLADES

.2	3.775	-99.703	20.053	13.028	10.624	9.271	8.300	7.459	6.713
.3	-17.791	58.762	-11.859	6.560	7.154	6.440	5.518	4.756	4.528
.4	45.225	28.649	30.989	-11.348	.654	1.084	-1.087	-2.546	-2.318
.5	24.916	18.504	16.926	23.891	-15.232	-10.446	11.500	35.125	33.735
.6	16.025	12.531	10.000	7.319	16.696	10.723	24.410	24.349	26.553
.7	10.790	7.387	3.216	-3.831	37.315	44.957	3.990	13.215	15.823
.8	5.726	1.402	4.866	32.192	27.180	24.993	36.736	-4.252	7.726
.9	-.272	5.287	27.147	22.722	19.411	17.776	18.369	33.296	-8.079
1.0	7.907	23.676	20.007	16.700	14.440	12.938	12.895	17.693	40.669

THREE BLADES

.2	14.201	-91.561	27.339	19.512	16.597	14.419	12.538	11.127	10.027
.3	-10.982	64.455	-7.180	10.050	8.611	5.349	5.585	7.331	7.310
.4	49.911	32.055	32.593	-13.705	-3.705	51.825	56.371	-5.262	1.068
.5	27.543	18.828	11.739	28.765	24.421	28.622	32.708	50.339	-18.872
.6	15.602	7.581	16.727	44.274	46.382	6.088	13.995	20.159	58.153
.7	5.714	17.873	35.305	28.355	25.743	36.625	6.374	38.780	43.968
.8	18.245	30.673	23.730	19.711	19.604	30.419	52.555	13.620	26.234
.9	29.780	20.996	16.952	17.442	25.644	30.350	31.501	46.439	5.303
1.0	19.281	14.712	16.155	23.130	25.575	24.126	23.477	27.836	50.807

FOUR BLADES

.2	27.119	-82.216	35.241	26.933	22.715	19.071	16.638	14.836	13.381
.3	-2.705	70.405	-2.840	10.683	26.782	3.520	9.914	9.975	9.612
.4	54.873	34.586	29.553	12.417	48.407	58.971	-13.835	-2.381	-.080
.5	28.814	15.218	38.282	59.680	14.554	21.194	62.844	12.290	29.893
.6	8.383	36.678	40.331	30.770	37.636	31.792	49.609	79.220	-.874
.7	29.717	36.632	23.626	13.184	52.501	59.676	20.341	38.427	65.534
.8	30.653	19.787	19.452	44.538	38.231	36.753	54.431	22.861	42.887
.9	16.383	18.287	37.637	31.349	29.360	34.385	41.347	58.147	18.242
1.0	19.760	32.548	26.703	24.947	30.581	33.306	33.593	37.710	61.218

TABLE I. CONTINUED

MU = .3 PSI = 0 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	5.984	-59.692	-22.399	-16.785	-17.426	-22.364	3.021	19.440	16.163
.3	1.114	7.791	-34.878	-21.780	-23.272	2.916	19.410	13.607	10.874
.4	-.500	-.395	5.871	-35.818	-2.793	16.323	11.238	8.927	7.615
.5	-2.286	-4.534	-8.360	24.136	2.159	4.823	5.833	5.750	5.348
.6	-5.564	-10.034	11.769	25.062	31.826	-7.908	.347	2.598	3.371
.7	-10.327	10.596	21.221	16.808	15.633	28.069	-12.054	-1.502	1.026
.8	10.196	19.560	15.019	12.266	11.582	12.517	27.672	-15.120	-2.279
.9	18.490	14.036	11.248	9.857	9.247	9.457	10.973	28.221	-17.911
1.0	13.270	10.321	8.990	8.155	7.727	7.657	8.176	9.978	29.112
									TWO BLADES
.2	20.028	-47.337	-10.890	-5.631	-6.195	-10.703	15.946	34.114	34.749
.3	10.270	16.161	-27.049	-13.962	-15.450	11.087	28.071	23.370	22.534
.4	6.344	5.973	11.990	-29.820	3.108	22.476	17.544	15.700	15.329
.5	3.083	.569	-3.466	28.924	6.915	9.602	10.706	10.765	10.644
.6	-1.159	-5.887	15.767	28.929	35.588	-4.235	3.917	6.027	6.532
.7	-6.690	14.018	24.457	19.860	18.522	30.725	-9.720	.312	2.030
.8	13.181	22.340	17.567	14.579	13.601	14.115	28.652	-15.098	-2.824
.9	20.903	16.185	13.137	11.388	10.299	9.804	10.376	27.024	-15.011
1.0	15.127	11.866	10.129	8.780	7.630	6.585	6.554	12.112	40.613
									THREE BLADES
.2	52.547	-22.784	8.145	11.191	10.928	10.446	50.616	16.419	5.061
.3	31.300	30.208	-15.494	-3.231	-4.564	23.404	43.697	52.276	1.226
.4	18.016	15.185	20.056	-22.175	10.831	30.608	27.069	28.438	37.041
.5	10.937	7.323	2.555	34.609	12.439	15.116	16.338	16.515	18.169
.6	4.753	-.703	20.384	33.160	39.397	-1.009	6.131	7.065	16.936
.7	-2.158	17.959	27.895	22.750	20.566	31.427	-10.627	7.076	26.274
.8	16.625	25.211	19.789	15.879	13.544	12.319	33.642	6.835	19.382
.9	23.376	17.955	14.110	10.705	7.925	13.667	30.776	47.247	-1.253
1.0	16.524	12.261	9.158	6.008	10.624	26.106	25.398	24.716	42.232
									FOUR BLADES
.2	6.150	-65.343	33.786	34.878	39.603	33.738	-.780	25.935	29.665
.3	-24.302	52.681	.496	10.137	9.866	42.084	79.027	3.578	10.435
.4	39.121	28.030	29.860	-13.410	19.673	41.122	41.578	72.603	-9.239
.5	22.086	15.567	9.492	40.837	18.297	20.950	22.284	27.042	100.395
.6	12.036	5.001	25.363	37.442	42.918	.799	7.021	38.623	46.753
.7	2.933	22.134	31.179	25.058	20.788	28.843	17.837	28.467	29.340
.8	20.267	27.885	21.365	15.113	8.528	40.117	53.164	6.299	17.790
.9	25.578	18.979	12.282	3.740	35.878	32.446	28.992	43.963	1.321
1.0	17.117	9.871	.201	34.489	29.327	23.675	21.476	25.746	53.763

TABLE I. CONTINUED

MU = .3 PSI = 30 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	11.532	-26.463	-13.046	-8.074	-6.216	-5.285	-4.750	-4.373	-4.095
.3	3.448	13.483	-21.926	-11.934	-7.748	-6.255	-5.546	-5.151	-4.807
.4	1.705	3.318	14.587	-21.405	-11.802	-8.467	-7.141	-6.489	-6.276
.5	.532	.984	2.425	15.141	-23.420	-13.309	-10.609	-9.584	-9.326
.6	-.714	-.940	-.976	-.017	13.289	-29.279	-16.413	-14.870	-16.120
.7	-2.452	-3.507	-4.501	-5.499	-10.350	14.169	-25.537	-4.807	1.481
.8	-5.768	-7.388	-9.036	-1.271	20.502	20.501	40.042	-3.490	8.945
.9	-12.570	-4.287	13.825	22.693	20.507	17.185	18.472	38.755	-14.094
1.0	6.042	19.015	16.362	15.921	13.583	12.578	13.149	.000	36.568

TWO BLADES

.2	48.692	23.910	-38.357	-38.898	-24.285	-18.396	-14.097	-11.490	-9.808
.3	24.267	35.072	4.117	15.678	9.462	-28.365	-22.584	-18.146	-13.387
.4	13.996	15.760	28.027	-6.591	6.466	15.937	16.654	-46.210	-22.346
.5	9.147	9.685	11.235	24.868	-12.393	-.251	5.353	20.015	.291
.6	5.889	5.695	5.865	7.158	21.067	-20.562	-6.308	-1.672	2.402
.7	2.904	1.837	.921	.137	-4.444	20.572	-18.497	3.613	11.925
.8	-1.341	-2.997	-4.623	3.238	25.179	25.432	45.402	2.494	15.916
.9	-8.863	-.649	17.431	26.325	24.204	21.001	22.499	43.092	-9.252
1.0	9.114	21.994	19.273	18.801	16.421	15.431	16.058	.000	39.836

THREE BLADES

.2	18.920	-7.313	21.468	-86.553	-35.423	-26.031	-20.584	-17.040	-14.658
.3	-5.240	5.718	-26.299	-3.126	-8.886	-45.945	-34.666	-24.756	-19.973
.4	4.324	67.951	53.982	37.740	30.789	41.603	-49.757	-39.397	-35.959
.5	30.083	26.524	26.577	40.957	3.350	20.624	32.610	27.627	-.958
.6	17.841	15.896	15.520	16.886	31.104	-9.227	7.537	22.519	18.551
.7	10.836	9.000	7.808	6.981	2.551	28.222	-9.782	14.641	28.764
.8	4.516	2.454	.593	8.324	30.237	30.692	51.044	8.815	24.180
.9	-4.408	3.475	21.303	29.978	27.687	24.371	25.812	46.393	-5.480
1.0	12.502	25.004	21.971	21.078	18.331	16.897	16.852	.000	39.757

FOUR BLADES

.2	58.804	42.784	9.579	-75.144	-46.793	-35.040	-27.452	-22.620	-19.540
.3	26.193	38.570	12.326	41.904	-53.565	-59.196	-43.363	-34.059	-26.535
.4	9.266	6.200	21.437	-15.932	14.199	7.158	-32.478	-71.866	-44.792
.5	-6.495	16.855	36.927	70.432	22.104	45.679	73.608	-6.337	-17.879
.6	52.427	29.945	29.175	29.286	43.109	5.075	25.123	108.196	-2.884
.7	22.265	18.084	16.319	14.875	10.505	36.563	-.262	28.581	66.399
.8	11.673	8.708	6.257	13.757	35.500	35.994	56.674	15.954	35.441
.9	.610	7.866	25.174	33.562	30.849	27.181	28.803	50.045	-1.732
1.0	16.050	28.087	24.341	22.606	18.626	17.368	18.786	.000	50.578

TABLE I, CONTINUED

MU = .3 PSI = 60 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	15.897	-19.826	-8.575	-5.153	-3.727	-2.972	-2.485	-2.157	-1.916
.3	5.385	17.438	-19.162	-8.029	-4.891	-3.586	-2.893	-2.442	-2.128
.4	3.222	5.426	18.827	-19.553	-7.659	-4.909	-3.629	-2.924	-2.481
.5	2.055	3.024	5.256	20.113	-21.182	-7.551	-4.984	-3.742	-3.039
.6	1.175	1.641	2.691	4.948	21.637	-23.031	-7.510	-5.151	-3.887
.7	.299	.627	1.163	2.184	4.466	22.985	-25.210	-7.700	-5.395
.8	-.722	-.584	-.285	.308	1.386	3.751	24.214	-27.670	-8.000
.9	-2.098	-2.231	-2.125	-1.644	-1.005	.246	2.774	25.465	-30.353
1.0	-4.151	-5.295	-5.321	-4.092	-3.433	-3.093	-2.231	1.392	26.365

TWO BLADES

.2	3.349	-28.621	-15.160	-10.258	-7.814	-6.330	-5.328	-4.602	-4.049
.3	-17.976	1.532	-29.589	-15.409	-10.397	-7.964	-6.440	-5.387	-4.642
.4	37.784	-58.343	-1.626	-33.380	-16.813	-11.256	-8.461	-6.758	-5.623
.5	21.643	28.158	36.356	-19.073	-39.388	-17.982	-12.355	-9.212	-7.179
.6	13.001	15.151	19.151	37.791	34.904	-48.557	-21.018	-14.579	-10.069
.7	8.887	9.968	11.967	15.937	20.899	47.003	-28.657	-36.627	-16.027
.8	5.936	6.573	7.600	9.373	12.011	17.140	46.298	31.550	-22.065
.9	3.368	3.501	4.031	5.169	6.593	9.424	15.162	46.710	-15.464
1.0	.371	-.569	-.317	1.301	2.554	3.693	6.007	12.167	39.882

THREE BLADES

.2	34.906	-55.536	-24.226	-16.001	-11.984	-9.612	-8.042	-6.925	-6.085
.3	24.053	45.669	-53.126	-27.494	-16.677	-12.290	-9.794	-8.124	-6.997
.4	8.823	16.252	40.112	-163.831	-29.139	-17.864	-13.071	-10.284	-8.499
.5	-2.225	2.942	10.913	42.648	-18.598	-33.508	-19.777	-14.153	-11.013
.6	-34.525	-8.600	-3.838	.589	29.745	22.723	-29.786	-23.513	-15.562
.7	30.875	31.470	39.077	14.185	-3.963	25.486	-20.313	-48.715	-28.656
.8	17.998	18.913	24.207	24.358	30.775	24.104	1.445	-5.655	-154.392
.9	11.436	11.614	13.354	14.698	17.767	25.058	41.803	45.379	-6.569
1.0	6.362	5.569	6.181	8.206	10.270	13.259	18.095	24.197	62.734

FOUR BLADES

.2	57.604	-76.819	-33.252	-21.533	-15.942	-12.754	-10.719	-9.232	-.000
.3	-5.210	26.484	-58.590	-38.563	-22.278	-16.372	-13.070	-10.871	-9.331
.4	43.839	-48.371	21.491	-11.080	-38.535	-23.953	-17.436	-13.751	-11.348
.5	23.596	32.004	43.988	-2.147	-18.846	-46.403	-26.414	-18.985	-14.648
.6	9.949	13.690	19.320	42.088	45.488	-1.985	-42.418	-31.053	-20.859
.7	-.641	1.969	-1.862	12.433	21.420	52.439	-15.723	-61.535	-36.335
.8	32.495	27.701	23.825	10.814	10.976	2.420	48.006	45.606	-89.319
.9	22.273	26.460	25.261	27.789	28.139	51.113	21.390	44.958	13.051
1.0	13.710	13.517	13.669	16.162	20.290	27.388	26.357	40.674	52.044

TABLE I, CONTINUED

MU = .3 PSI = 90 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	19.201	-16.621	-5.886	-3.436	-2.458	-1.930	-1.582	-1.346	-1.172
.3	7.330	19.929	-17.754	-5.754	-3.437	-2.423	-1.908	-1.565	-1.332
.4	4.535	7.241	20.977	-19.021	-5.680	-3.464	-2.433	-1.920	-1.579
.5	3.190	4.380	7.055	22.289	-20.631	-5.648	-3.504	-2.464	-1.935
.6	2.351	3.051	4.197	6.778	23.730	-22.469	-5.647	-3.548	-2.440
.7	1.639	2.146	2.852	4.142	6.597	25.378	-24.467	-5.684	-3.588
.8	.966	1.361	1.873	2.634	3.921	6.347	27.100	-26.550	-5.760
.9	.239	.601	1.049	1.612	2.383	3.676	6.100	28.894	-28.738
1.0	-.645	-.233	.207	.723	1.347	2.018	3.419	5.792	30.734

TWO BLADES

.2	14.394	-20.202	-8.703	-5.727	-4.375	-3.567	-3.006	-2.599	-2.288
.3	1.220	15.513	-21.088	-8.456	-5.654	-4.288	-3.509	-2.956	-2.565
.4	-5.055	.844	16.389	-22.466	-8.434	-5.722	-4.327	-3.542	-2.987
.5	-14.758	-7.765	.015	17.375	-24.319	-8.542	-5.855	-4.426	-3.608
.6	27.918	-36.917	-8.086	-.910	18.326	-26.444	-8.719	-6.017	-4.488
.7	22.198	27.136	-16.145	-9.122	-2.865	19.271	-28.750	-8.891	-6.191
.8	12.911	16.321	23.725	8.729	-24.327	-5.540	20.578	-31.078	-9.156
.9	8.870	10.691	13.741	20.588	74.133	-22.143	-4.261	22.243	-33.496
1.0	6.103	7.439	9.310	12.788	22.465	23.286	-3.381	-5.043	23.723

THREE BLADES

.2	1.394	-26.349	-12.500	-8.470	-6.534	-5.338	-4.506	-3.900	-3.438
.3	-23.351	4.393	-27.033	-12.212	-8.357	-6.418	-5.250	-4.440	-3.827
.4	32.930	-13.578	3.474	-28.549	-12.224	-8.476	-6.476	-5.302	-4.482
.5	15.185	36.922	-39.660	5.745	-30.273	-12.456	-8.657	-6.604	-5.416
.6	7.306	13.909	25.292	-2.578	6.260	-32.745	-12.839	-8.957	-6.784
.7	.315	5.211	10.777	21.211	9.557	8.651	-36.025	-13.370	-9.295
.8	-9.889	-2.696	.816	8.121	17.037	10.888	-1.132	-39.814	-13.901
.9	29.342	7.622	-24.311	-.688	6.825	17.531	62.053	-17.274	-42.692
1.0	18.182	27.181	39.079	3.399	-3.939	5.410	20.909	101.118	1.197

FOUR BLADES

.2	-23.943	-33.717	-16.668	-11.345	-8.719	-7.122	-5.998	-5.191	-4.579
.3	38.691	-12.271	-34.620	-16.243	-10.911	-8.543	-7.002	-5.911	-5.126
.4	9.991	46.113	-51.209	-35.917	-16.225	-11.279	-8.639	-7.067	-5.967
.5	-6.207	7.159	35.300	-2.068	-36.940	-16.506	-11.465	-8.866	-7.226
.6	32.985	-29.099	5.055	23.032	-39.901	-39.700	-17.077	-11.978	-9.090
.7	24.187	31.119	-9.333	2.241	24.608	1.191	-42.718	-17.816	-12.430
.8	11.030	16.603	26.657	14.522	-14.099	11.501	10.600	-47.961	-18.831
.9	-1.278	4.404	12.549	22.282	78.845	-12.619	13.418	-1.817	-55.629
1.0	13.602	-2.111	3.593	10.049	22.441	26.518	5.755	23.645	-105.364

TABLE I, CONTINUED

MU = .3 PSI = 120 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	22.384	-14.104	-4.019	-2.343	-1.620	-1.245	-1.008	-.847	-.730
.3	10.090	21.499	-15.401	-4.186	-2.425	-1.678	-1.262	-1.026	-.860
.4	6.185	9.560	21.721	-17.228	-4.319	-2.511	-1.685	-1.322	-1.062
.5	4.426	5.947	9.039	22.586	-19.024	-4.420	-2.597	-1.811	-1.358
.6	3.372	4.222	5.712	8.556	23.839	-20.949	-4.561	-2.681	-1.777
.7	2.613	3.180	4.060	5.468	8.057	25.342	-22.975	-4.681	-2.751
.8	1.997	2.439	3.013	3.883	5.263	7.742	27.005	-25.066	-4.807
.9	1.434	1.814	2.275	2.847	3.664	5.012	7.420	28.819	-27.199
1.0	.855	1.237	1.622	2.103	2.711	3.487	4.802	7.169	30.694

TWO BLADES

.2	20.141	-15.839	-5.420	-3.510	-2.605	-2.106	-1.764	-1.525	-1.340
.3	7.559	19.551	-16.967	-5.481	-3.521	-2.622	-2.088	-1.756	-1.516
.4	2.930	7.105	19.800	-18.779	-5.606	-3.603	-2.626	-2.145	-1.798
.5	-.643	2.487	6.495	20.613	-20.615	-5.740	-3.719	-2.776	-2.192
.6	-5.550	-1.171	2.115	5.898	21.784	-22.604	-5.934	-3.845	-2.778
.7	-24.786	-7.209	-1.523	1.720	5.343	23.193	-24.705	-6.115	-3.965
.8	61.529	-16.006	-6.308	-1.785	1.454	4.897	24.778	-26.875	-6.306
.9	20.411	18.503	-13.097	-6.569	-2.048	.899	4.383	26.468	-29.092
1.0	12.279	16.406	30.461	-17.799	-6.620	-2.823	.427	4.062	28.255

THREE BLADES

.2	15.327	-18.649	-7.393	-5.020	-3.816	-3.105	-2.623	-2.270	-1.993
.3	-.104	15.544	-19.566	-7.351	-4.961	-3.787	-3.067	-2.599	-2.249
.4	-18.636	.229	16.027	-21.297	-7.449	-5.034	-3.797	-3.128	-2.641
.5	18.187	-11.300	.181	16.883	-23.139	-7.601	-5.171	-3.967	-3.205
.6	21.944	22.405	-10.460	-.594	17.992	-25.165	-7.800	-5.346	-4.011
.7	12.440	21.017	10.530	-16.556	-1.702	19.288	-27.344	-8.071	-5.513
.8	6.449	11.746	24.979	53.852	-21.469	-2.254	20.814	-29.555	-8.321
.9	.470	4.985	11.389	27.606	15.333	-13.524	-2.177	22.571	-31.839
1.0	-5.802	-3.615	4.149	10.602	20.733	6.174	-8.726	-2.065	24.348

FOUR BLADES

.2	7.712	-22.253	-9.585	-6.626	-5.067	-4.132	-3.489	-3.022	-2.665
.3	-24.445	9.226	-22.713	-9.410	-6.502	-5.006	-4.073	-3.446	-2.994
.4	64.573	-16.449	10.379	-24.345	-9.509	-6.583	-5.018	-4.141	-3.506
.5	17.720	39.350	-12.793	11.703	-26.149	-9.638	-6.741	-5.225	-4.235
.6	5.327	16.606	39.173	-10.947	12.799	-28.282	-9.973	-6.958	-5.296
.7	-17.658	3.297	16.007	12.549	-12.872	13.689	-30.491	-10.279	-7.177
.8	66.002	-9.288	4.041	17.469	25.521	-22.049	14.608	-32.839	-10.602
.9	22.257	22.508	-6.749	3.697	21.428	160.874	-28.921	15.932	-35.315
1.0	10.736	17.698	33.941	-11.757	3.611	23.121	82.159	-24.307	17.811

TABLE I. CONTINUED

MU = .3 PSI = 150 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	29.401	-10.281	-2.568	-1.412	-.945	-.705	-.558	-.459	-.386
.3	14.073	24.176	-12.241	-2.899	-1.581	-1.056	-.779	-.611	-.498
.4	8.162	12.835	22.353	-14.177	-3.187	-1.735	-1.163	-.854	-.669
.5	5.605	7.662	11.771	22.200	-16.135	-3.440	-1.891	-1.265	-.930
.6	4.460	5.462	7.229	10.807	22.608	-18.139	-3.663	-2.018	-1.361
.7	3.571	4.195	5.158	6.865	9.979	24.035	-20.196	-3.818	-2.145
.8	2.878	3.340	3.963	4.855	6.525	9.269	25.490	-22.300	-4.047
.9	2.312	2.676	3.133	3.748	4.634	6.224	8.704	27.124	-24.439
1.0	1.799	2.135	2.508	2.958	3.582	4.473	5.888	8.253	28.922

TWO BLADES

.2	28.577	-10.956	-3.135	-1.894	-1.366	-1.075	-.889	-.758	-.658
.3	13.101	23.333	-12.891	-3.449	-2.054	-1.466	-1.141	-.939	-.794
.4	6.810	11.797	21.522	-14.863	-3.765	-2.232	-1.598	-1.241	-1.014
.5	3.600	6.200	10.645	21.300	-16.878	-4.066	-2.429	-1.730	-1.341
.6	1.383	3.323	5.657	9.589	21.631	-18.946	-4.341	-2.602	-1.863
.7	-1.782	.914	2.886	5.181	8.675	22.980	-21.064	-4.551	-2.766
.8	-8.261	-2.087	.564	2.481	4.746	7.882	24.368	-23.233	-4.829
.9	-10.885	-6.862	-2.172	.275	2.165	4.357	7.234	25.935	-25.434
1.0	19.333	-6.294	-6.080	-2.179	.044	1.914	3.945	6.710	27.664

THREE BLADES

.2	26.652	-12.233	-4.056	-2.609	-1.942	-1.560	-1.299	-1.118	-.976
.3	10.365	21.593	-14.088	-4.350	-2.770	-2.054	-1.640	-1.358	-1.161
.4	2.177	9.178	19.814	-16.073	-4.693	-2.969	-2.208	-1.749	-1.446
.5	-6.620	1.834	8.115	19.577	-18.136	-5.037	-3.200	-2.368	-1.888
.6	-12.448	-5.272	1.375	6.996	19.856	-20.257	-5.355	-3.421	-2.550
.7	31.130	-19.273	-4.756	1.086	6.050	21.155	-22.440	-5.622	-3.635
.8	16.526	35.528	-22.157	-4.822	.615	5.269	22.469	-24.660	-5.952
.9	10.170	16.193	24.823	-12.944	-4.992	.179	4.488	23.966	-26.921
1.0	4.907	9.604	15.781	17.053	-8.592	-5.292	-.293	3.903	25.631

FOUR BLADES

.2	23.543	-13.912	-5.159	-3.403	-2.562	-2.064	-1.728	-1.483	-1.300
.3	4.853	19.069	-15.654	-5.422	-3.571	-2.679	-2.151	-1.802	-1.544
.4	-9.556	4.520	17.407	-17.535	-5.789	-3.805	-2.872	-2.301	-1.921
.5	49.707	-10.540	3.560	17.135	-19.724	-6.179	-4.081	-3.082	-2.465
.6	27.085	-24.914	-11.607	2.524	17.377	-21.815	-6.554	-4.349	-3.291
.7	11.558	24.477	-5.650	-9.405	1.663	18.634	-24.103	-6.863	-4.610
.8	.656	10.904	21.695	-3.306	-7.618	.986	19.939	-26.414	-7.255
.9	-4.725	1.703	10.427	21.194	-8.017	-7.008	.448	21.427	-28.705
1.0	23.256	-.454	2.158	10.026	23.535	-21.633	-7.370	.000	23.081

TABLE I, CONTINUED

MU = .3 PSI = 180 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	62.854	-5.610	-1.184	-.571	-.326	-.221	-.156	-.114	-.088
.3	19.660	35.464	-8.132	-1.707	-.829	-.482	-.335	-.239	-.180
.4	11.133	17.123	26.610	-10.349	-2.140	-1.064	-.608	-.445	-.322
.5	7.688	9.790	15.314	23.374	-12.469	-2.515	-1.170	-.772	-.547
.6	5.830	6.684	8.918	13.676	22.445	-14.554	-2.840	-1.462	-.895
.7	4.678	5.328	6.310	8.282	12.408	22.773	-16.651	-3.109	-1.624
.8	3.836	4.276	4.815	5.883	7.771	11.286	23.685	-18.752	-3.374
.9	3.195	3.524	3.973	4.519	5.541	7.330	10.335	24.985	-20.903
1.0	2.643	2.914	3.253	3.703	4.328	5.243	6.927	9.565	26.527

TWO BLADES

.2	63.064	-5.486	-1.111	-.524	-.299	-.203	-.143	-.109	-.085
.3	19.705	35.471	-8.142	-1.721	-.846	-.507	-.357	-.260	-.202
.4	10.895	16.953	26.455	-10.476	-2.245	-1.155	-.689	-.511	-.381
.5	7.036	9.311	14.948	23.088	-12.700	-2.704	-1.334	-.906	-.658
.6	4.588	5.799	8.257	13.171	22.036	-14.881	-3.104	-1.686	-1.082
.7	2.512	3.866	5.235	7.468	11.780	22.266	-17.061	-3.444	-1.910
.8	.291	1.962	3.146	4.649	6.827	10.550	23.091	-19.230	-3.776
.9	-3.071	-.297	1.385	2.692	4.185	6.287	9.504	24.314	-21.459
1.0	-8.667	-3.265	-.786	.974	2.367	3.768	5.782	8.649	25.777

THREE BLADES

.2	62.808	-5.688	-1.238	-.619	-.367	-.258	-.189	-.144	-.113
.3	18.942	35.000	-8.463	-1.956	-1.019	-.644	-.469	-.346	-.266
.4	9.336	15.976	25.821	-10.920	-2.574	-1.403	-.886	-.663	-.511
.5	3.969	7.551	13.850	22.327	-13.252	-3.118	-1.659	-1.169	-.873
.6	-1.754	2.614	6.323	11.896	21.161	-15.542	-3.613	-2.078	-1.403
.7	-10.267	-2.446	1.888	5.382	10.379	21.263	-17.807	-4.026	-2.373
.8	35.825	-11.252	-3.118	1.145	4.603	9.030	22.003	-20.067	-4.432
.9	19.808	37.722	-12.304	-3.510	.549	4.081	7.891	23.123	-22.373
1.0	12.879	18.592	39.873	-13.522	-3.807	.139	3.348	6.930	24.506

FOUR BLADES

.2	62.057	-6.046	-1.452	-.000	-.472	-.335	-.247	-.191	-.149
.3	17.286	34.172	-8.955	-2.293	-1.256	-.811	-.594	-.448	-.355
.4	5.725	14.191	24.791	-11.573	-3.021	-1.731	-1.128	-.857	-.660
.5	-4.925	3.891	11.899	21.145	-14.029	-3.664	-2.062	-1.475	-1.118
.6	-70.514	-6.808	2.549	9.863	19.850	-16.422	-4.239	-2.562	-1.776
.7	35.185	-84.413	-8.210	1.422	8.308	19.867	-18.787	-4.744	-2.923
.8	15.589	36.034	-98.260	-9.799	.469	6.720	20.491	-21.131	-5.223
.9	7.249	14.579	37.362	-111.863	-11.380	-.407	5.442	21.563	-23.511
1.0	-1.307	6.483	13.726	39.070	-125.293	-13.005	-1.232	4.410	22.810

TABLE I, CONTINUED

MU = .3 PSI = 210 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	581.641	-.871	.191	.275	.278	.264	.245	.231	.215
.3	32.111	110.562	-3.901	-.520	-.063	.052	.106	.129	.137
.4	16.094	21.681	48.954	-6.439	-1.136	-.412	-.161	-.046	.014
.5	10.513	12.848	18.316	31.957	-8.921	-1.666	-.640	-.332	-.187
.6	7.744	8.828	10.827	16.139	25.825	-11.110	-2.115	-.970	-.531
.7	6.085	6.683	7.733	9.620	14.464	23.616	-13.239	-2.496	-1.191
.8	4.955	5.318	5.870	6.963	8.768	12.978	23.182	-15.341	-2.809
.9	4.142	4.406	4.812	5.434	6.390	8.118	11.889	23.662	-17.437
1.0	3.481	3.695	4.003	4.422	5.007	5.930	7.681	10.885	24.717

TWO BLADES

.2	582.799	-.017	.856	.815	.730	.653	.582	.530	.484
.3	32.998	111.243	-3.353	-.065	.313	.386	.402	.391	.376
.4	16.675	22.147	49.342	-6.112	-.839	-.155	.071	.167	.212
.5	10.736	13.051	18.501	32.127	-8.759	-1.512	-.484	-.183	-.050
.6	7.515	8.694	10.750	16.109	25.829	-11.085	-2.070	-.915	-.470
.7	5.265	6.101	7.316	9.334	14.267	23.475	-13.338	-2.555	-1.224
.8	3.321	4.102	4.997	6.322	8.290	12.618	22.911	-15.545	-2.961
.9	1.144	2.337	3.294	4.315	5.558	7.479	11.395	23.278	-17.731
1.0	-1.806	.186	1.515	2.630	3.669	4.913	6.897	10.272	24.227

THREE BLADES

.2	583.922	.760	1.463	1.302	1.138	1.003	.893	.805	.733
.3	33.608	111.778	-2.935	.286	.634	.664	.648	.624	.591
.4	16.706	22.240	49.484	-5.948	-.679	.014	.231	.323	.364
.5	9.912	12.618	18.240	32.012	-8.796	-1.508	-.456	-.130	.024
.6	5.316	7.324	9.957	15.579	25.502	-11.302	-2.199	-.990	-.503
.7	.492	3.209	5.509	8.166	13.503	22.953	-13.695	-2.803	-1.396
.8	-6.453	-1.613	1.474	4.130	6.873	11.665	22.238	-16.022	-3.319
.9	11.661	-10.720	-3.376	.201	3.006	5.891	10.243	22.461	-18.349
1.0	25.148	19.056	-17.160	-4.867	-1.067	2.024	5.022	8.958	23.275

FOUR BLADES

.2	584.957	1.511	2.035	1.766	1.533	1.348	1.194	1.078	.981
.3	33.913	112.059	-2.623	.584	.894	.917	.887	.831	.788
.4	16.112	21.972	49.423	-5.926	-.585	.118	.361	.459	.496
.5	7.335	11.434	17.530	31.619	-8.998	-1.591	-.463	-.103	.067
.6	-3.059	3.836	8.139	14.506	24.881	-11.677	-2.436	-1.126	-.583
.7	-16.092	-8.520	1.278	6.022	12.179	22.127	-14.247	-3.164	-1.645
.8	27.852	-24.842	-11.232	-.639	4.358	10.086	21.232	-16.725	-3.798
.9	17.059	28.416	48.931	-9.845	-2.086	3.052	8.571	21.288	-19.163
1.0	9.227	14.399	27.519	31.533	-8.515	-3.501	2.076	7.000	21.956

TABLE I, CONTINUED

MU = .3 PSI = 240 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-79.109	4.238	1.782	1.225	.977	.817	.704	.622	.559
.3	42.312	73.930	-.013	.731	.718	.651	.590	.535	.493
.4	28.766	34.349	79.555	-3.673	-.180	.244	.349	.377	.374
.5	15.309	16.753	21.557	48.355	-6.581	-.956	-.172	.078	.180
.6	10.465	11.142	12.724	17.098	33.441	-8.915	-1.598	-.537	-.168
.7	7.841	8.253	8.932	10.686	14.834	27.199	-11.006	-2.114	-.838
.8	6.329	6.498	7.008	7.673	9.339	13.343	24.629	-13.027	-2.531
.9	5.252	5.388	5.678	6.121	6.996	8.555	12.181	23.909	-15.063
1.0	4.426	4.534	4.728	5.054	5.487	6.371	7.910	11.221	24.189

TWO BLADES

.2	-76.957	5.879	3.097	2.315	1.904	1.616	1.412	1.254	1.128
.3	44.026	75.297	1.116	1.684	1.540	1.376	1.236	1.114	1.018
.4	30.100	35.445	80.477	-2.873	.515	.855	.906	.880	.840
.5	16.257	17.554	22.246	48.955	-6.037	-.468	.280	.493	.573
.6	11.005	11.600	13.137	17.469	33.792	-8.586	-1.278	-.235	.130
.7	7.887	8.299	9.000	10.766	14.943	27.335	-10.861	-1.944	-.660
.8	5.720	6.010	6.625	7.390	9.150	13.221	24.560	-13.030	-2.500
.9	3.749	4.165	4.682	5.338	6.399	8.100	11.842	23.667	-15.235
1.0	1.428	2.167	2.848	3.595	4.323	5.460	7.203	10.685	23.780

THREE BLADES

.2	-74.593	7.675	4.492	3.444	2.850	2.434	2.122	1.883	1.694
.3	45.868	76.745	2.278	2.653	2.372	2.098	1.874	1.689	1.542
.4	31.323	36.453	81.332	-2.141	1.166	1.459	1.436	1.379	1.287
.5	16.805	18.030	22.691	49.390	-5.626	-.054	.659	.854	.920
.6	10.600	11.333	13.020	17.449	33.875	-8.448	-1.094	-.030	.348
.7	5.965	6.884	8.011	10.120	14.551	27.108	-10.949	-1.964	-.615
.8	.503	2.571	4.172	5.671	8.047	12.454	24.067	-13.363	-2.696
.9	-14.099	-3.915	-.362	1.693	3.875	6.418	10.720	22.914	-15.751
1.0	19.599	-9.764	-6.747	-3.503	-1.008	2.041	5.039	9.296	22.791

FOUR BLADES

.2	-71.688	9.600	5.936	4.585	3.802	3.243	2.830	2.514	2.254
.3	47.726	78.175	3.436	3.609	3.185	2.797	2.497	2.255	2.049
.4	32.325	37.302	82.071	-1.470	1.774	1.994	1.946	1.842	1.731
.5	16.644	18.059	22.812	49.596	-5.341	.256	.997	1.202	1.257
.6	8.426	9.837	12.269	16.971	33.658	-8.466	-1.008	.121	.536
.7	.243	1.637	5.037	8.340	13.574	26.592	-11.261	-2.092	-.636
.8	-9.964	-9.467	-6.211	1.310	5.390	10.869	23.128	-13.893	-3.010
.9	26.830	24.941	-25.912	-6.867	-1.923	2.910	8.793	21.661	-16.542
1.0	17.335	20.044	31.059	32.039	-11.773	-5.219	.325	6.592	21.216

TABLE I, CONTINUED

MU = .3 PSI = 270 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-30.575	12.511	4.051	2.554	1.906	1.544	1.309	1.142	1.012
.3	-30.515	-92.131	4.149	2.308	1.712	1.404	1.200	1.051	.942
.4	80.456	49.834	57.943	-3.382	.705	.954	.956	.876	.815
.5	24.476	21.322	22.591	37.476	-7.433	-.570	.306	.535	.578
.6	14.757	13.700	13.981	16.566	30.429	-9.521	-1.522	-.231	.182
.7	10.427	9.963	10.086	10.954	13.878	26.508	-11.059	-2.214	-.671
.8	8.122	7.834	7.881	8.299	9.429	12.244	24.469	-12.644	-2.743
.9	6.592	6.416	6.427	6.629	7.161	8.411	11.268	23.908	-14.408
1.0	5.515	5.365	5.383	5.513	5.827	6.436	7.684	10.465	23.790

TWO BLADES

.2	-27.273	15.126	6.190	4.357	3.458	2.904	2.509	2.218	1.991
.3	-27.851	-89.947	5.995	3.898	3.100	2.638	2.304	2.041	1.837
.4	82.596	51.644	59.495	-2.030	1.908	2.030	1.930	1.758	1.628
.5	26.168	22.763	23.839	38.561	-6.452	.317	1.104	1.287	1.265
.6	16.013	14.744	14.892	17.360	31.142	-8.871	-.917	.334	.719
.7	11.204	10.584	10.575	11.368	14.249	26.847	-10.729	-1.882	-.348
.8	8.342	7.931	7.878	8.251	9.376	12.197	24.457	-12.615	-2.666
.9	6.135	5.804	5.749	5.951	6.520	7.840	10.788	23.528	-14.692
1.0	4.077	3.768	3.702	3.896	4.374	5.144	6.534	9.506	23.018

THREE BLADES

.2	-23.060	18.127	8.609	6.333	5.119	4.329	3.759	3.330	2.979
.3	-24.647	-87.415	8.057	5.630	4.572	3.922	3.437	3.054	2.761
.4	85.033	53.604	61.145	-.616	3.130	3.119	2.904	2.651	2.442
.5	27.863	24.139	24.966	39.551	-5.584	1.104	1.862	1.967	1.923
.6	16.870	15.412	15.346	17.748	31.509	-8.480	-.505	.775	1.154
.7	11.195	10.358	10.091	10.911	13.845	26.618	-10.818	-1.845	-.207
.8	6.677	5.756	5.645	6.252	7.651	10.880	23.537	-13.179	-3.013
.9	1.757	-.003	-.603	1.230	2.331	4.270	8.341	21.891	-15.790
1.0	-5.237	-2.423	-20.132	-3.573	-4.059	-4.216	.307	5.883	20.619

FOUR BLADES

.2	-18.125	21.637	11.156	8.381	6.801	5.768	4.996	4.433	3.974
.3	-21.042	-84.655	10.226	7.402	6.084	5.230	4.591	4.077	3.678
.4	87.571	55.590	62.771	.761	4.333	4.187	3.884	3.534	3.259
.5	29.358	25.292	25.886	40.305	-4.812	1.820	2.553	2.664	2.577
.6	17.056	15.182	15.014	17.480	31.409	-8.362	-.248	1.119	1.578
.7	8.935	7.768	7.202	8.540	12.176	25.631	-11.351	-2.021	-.173
.8	-2.926	-.703	-2.352	-2.825	2.730	7.154	21.363	-14.393	-3.600
.9	2.810	15.810	16.459	-2.811	-1.626	-3.419	.257	18.425	-17.466
1.0	30.413	25.737	24.138	31.086	29.443	31.935	-13.852	-6.298	16.241

TABLE I, CONTINUED

MU = .3 PSI = 300 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-10.715	49.841	9.776	5.115	3.550	2.774	2.314	1.994	1.761
.3	-9.321	-24.289	7.107	5.026	3.333	2.582	2.140	1.856	1.637
.4	-17.169	23.240	43.820	-16.834	1.151	1.774	1.709	1.571	1.439
.5	15.790	28.340	22.138	27.863	-14.806	-1.058	.659	1.015	1.084
.6	26.132	17.048	14.676	15.056	24.323	-12.963	-2.126	-.141	.472
.7	14.773	11.879	10.762	10.886	12.404	22.844	-12.735	-3.050	-.713
.8	10.635	9.294	8.660	8.552	9.078	11.075	23.042	-13.647	-3.508
.9	8.319	7.552	7.132	7.009	7.239	8.019	10.158	23.366	-15.228
1.0	6.842	6.328	6.017	5.909	6.000	6.295	7.250	9.434	24.110

TWO BLADES

.2	-5.816	53.835	13.135	8.018	6.102	5.046	4.354	3.841	3.435
.3	-5.469	-21.011	9.956	7.545	5.584	4.614	3.984	3.541	3.182
.4	-14.043	25.956	46.220	-14.692	3.082	3.526	3.299	3.031	2.783
.5	18.345	30.568	24.101	29.621	-13.234	.358	1.942	2.187	2.165
.6	28.171	18.809	16.207	16.380	25.463	-11.962	-1.261	.632	1.182
.7	16.309	13.149	11.797	11.682	13.012	23.304	-12.416	-2.829	-.554
.8	11.647	10.031	9.096	8.732	9.004	10.769	22.586	-14.252	-4.158
.9	8.734	7.631	6.847	6.318	6.157	6.555	8.418	21.526	-17.246
1.0	6.484	5.472	4.645	3.961	3.310	2.814	3.339	5.394	19.602

THREE BLADES

.2	.895	58.837	17.138	11.360	8.947	7.511	6.516	5.758	5.150
.3	-.358	-16.959	13.327	10.418	8.101	6.823	5.951	5.301	4.769
.4	-10.113	29.176	48.937	-12.356	5.127	5.334	4.915	4.517	4.148
.5	21.317	33.013	26.135	31.293	-11.846	1.516	2.986	3.172	3.125
.6	30.312	20.453	17.436	17.135	25.834	-11.716	-1.196	.713	1.428
.7	17.556	13.787	11.800	11.024	11.743	21.524	-14.443	-4.526	-1.751
.8	11.697	9.229	7.292	5.284	4.095	5.544	15.155	-19.906	-8.523
.9	6.869	4.266	2.103	-.843	-9.442	4.314	9.996	18.176	-24.927
1.0	.226	-3.892	1.227	15.281	36.649	26.926	28.180	36.726	48.026

FOUR BLADES

.2	9.472	64.520	21.442	14.859	11.865	10.020	8.697	7.682	6.874
.3	5.631	-12.458	16.993	13.497	10.710	9.074	7.936	7.063	6.369
.4	-5.632	32.685	51.774	-9.990	7.140	7.084	6.502	5.975	5.504
.5	24.536	35.450	27.928	32.666	-10.920	2.266	3.745	4.048	4.077
.6	32.284	21.785	17.732	16.558	24.469	-13.487	-2.597	.188	1.534
.7	18.050	12.948	9.403	7.007	2.719	15.180	-24.011	-8.857	-3.924
.8	10.163	4.329	-3.611	4.452	25.691	34.153	48.946	-8.912	-16.452
.9	2.180	6.271	41.204	30.318	29.385	29.793	31.561	49.037	12.591
1.0	16.061	27.371	26.618	21.958	19.444	18.514	19.159	22.545	39.677

TABLE I, CONTINUED

MU = .3 PSI = 330 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-.891	-278.713	-77.366	22.091	9.778	6.416	4.872	4.070	3.529
.3	-2.375	-1.582	-104.144	17.575	8.197	5.522	4.311	3.614	3.162
.4	-4.965	-12.048	30.901	-13.995	1.693	3.244	3.167	2.895	2.652
.5	-10.266	-.261	28.407	27.821	-12.415	-1.842	1.202	1.954	1.981
.6	-9.916	25.019	17.545	15.477	24.053	-12.021	-3.063	.061	.975
.7	25.778	16.436	12.769	11.544	12.306	23.445	-12.933	-3.656	-.695
.8	16.456	11.847	10.046	9.271	9.277	10.754	23.766	-14.559	-3.964
.9	11.324	9.241	8.228	7.687	7.601	8.066	9.794	24.525	-16.559
1.0	8.765	7.571	6.913	6.529	6.376	6.562	7.165	9.045	25.478

TWO BLADES

.2	6.797	-272.355	-71.821	27.094	14.335	10.677	8.888	7.869	7.114
.3	3.213	3.422	-99.647	21.708	12.055	9.165	7.778	6.926	6.323
.4	-.444	-7.980	34.609	-10.562	4.907	6.267	6.018	5.579	5.160
.5	-6.582	3.078	31.469	30.639	-9.817	.534	3.343	3.803	3.574
.6	-6.897	27.736	20.016	17.675	25.996	-10.391	-1.813	.745	.928
.7	28.227	18.591	14.647	13.099	13.490	24.152	-12.938	-4.742	-3.552
.8	18.243	13.407	11.291	10.081	9.525	10.137	21.855	-18.164	-8.714
.9	12.657	10.197	8.724	7.528	6.445	5.230	4.657	21.805	-3.992
1.0	9.483	7.799	6.455	5.222	3.100	-.212	1.790	23.641	42.455

THREE BLADES

.2	19.205	-263.613	-64.781	33.306	19.852	15.858	13.688	12.154	11.006
.3	11.800	9.825	-94.060	26.776	16.698	13.574	11.956	10.805	9.832
.4	5.753	-2.876	39.049	-6.573	8.547	9.521	8.776	7.795	6.718
.5	-1.823	7.066	34.926	33.597	-7.336	2.166	3.659	2.298	1.909
.6	-3.253	30.785	22.466	19.461	26.846	-11.284	-6.086	4.913	32.251
.7	30.920	20.663	15.964	13.227	11.518	20.169	-3.733	24.614	24.025
.8	20.099	14.364	10.990	7.347	1.798	21.967	46.680	5.452	13.793
.9	13.361	9.601	6.110	2.677	21.646	31.286	27.194	39.255	-3.461
1.0	8.526	5.023	1.394	18.446	26.186	22.358	19.785	20.225	35.593

FOUR BLADES

.2	40.914	-252.670	-56.419	40.251	26.312	21.629	18.726	16.517	14.648
.3	23.863	17.869	-87.620	32.460	21.937	18.521	16.554	14.709	13.091
.4	13.670	2.960	43.967	-2.326	12.176	12.272	10.259	9.251	7.687
.5	3.648	11.425	38.425	36.289	-6.164	1.329	7.089	47.062	41.301
.6	.720	33.766	24.496	19.897	23.576	-7.724	30.799	32.121	36.225
.7	33.560	22.148	15.800	10.720	18.553	54.471	11.514	17.869	20.265
.8	21.296	13.508	6.670	15.202	34.296	31.263	40.133	-.864	9.145
.9	12.061	2.502	8.244	32.027	25.520	21.381	19.210	35.660	9.837
1.0	4.686	10.475	34.270	23.516	17.784	12.678	13.604	34.879	53.536

TABLE I, CONTINUED

MU = .4 PSI = 0 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	5.508	-43.305	-25.743	-17.353	-13.861	-13.086	-13.978	-15.938	-16.423
.3	1.429	7.823	-29.048	-20.642	-13.818	-12.665	-13.990	-17.188	-1.534
.4	.436	1.477	9.703	-24.315	-19.602	-15.579	-17.561	-2.417	15.096
.5	-.149	.008	.805	9.950	-26.168	-23.057	-5.262	13.249	11.202
.6	-.851	-1.255	-1.848	-2.724	6.300	-17.417	6.456	8.176	6.927
.7	-1.815	-2.735	-4.735	-7.001	5.607	35.293	-5.618	1.238	2.821
.8	-3.279	-5.344	-7.773	2.761	18.846	18.322	31.180	-12.359	-1.132
.9	-5.554	-8.000	1.731	17.202	15.079	12.914	13.281	29.936	-16.213
1.0	-8.324	1.030	16.393	13.912	11.362	10.189	9.978	11.270	30.355
									TWO BLADES
.2	21.003	-29.725	-13.772	-6.097	-3.098	-2.501	-3.240	-4.812	-4.506
.3	11.391	16.727	-20.952	-12.824	-6.254	-5.200	-6.594	-9.280	6.726
.4	7.695	8.062	15.966	-18.290	-13.711	-9.723	-11.639	3.667	21.471
.5	5.507	5.328	5.864	14.831	-21.360	-18.287	-.449	18.158	16.285
.6	3.821	3.157	2.377	1.388	10.342	-13.432	10.456	12.223	11.066
.7	2.122	1.016	-1.138	-3.494	9.032	38.674	-2.274	4.587	6.201
.8	.100	-2.124	-4.685	5.755	21.771	21.198	33.993	-9.597	1.563
.9	-2.635	-5.299	4.405	19.801	17.570	15.313	15.571	32.138	-14.157
1.0	-5.791	3.430	18.711	16.099	13.435	12.132	11.792	12.895	31.726
									THREE BLADES
.2	-37.676	-13.451	12.873	14.413	14.429	14.627	15.444	14.768	23.946
.3	32.699	41.539	-5.901	-.220	4.969	5.929	5.052	4.134	22.623
.4	30.087	20.932	26.145	-9.568	-5.574	-2.009	-3.503	12.753	32.108
.5	17.108	14.020	13.289	21.531	-15.069	-12.150	5.809	24.804	23.671
.6	11.741	9.708	8.098	6.693	15.349	-8.538	15.363	17.227	16.338
.7	8.100	6.126	3.474	.823	13.113	42.593	1.543	8.306	9.812
.8	4.812	2.067	-.858	9.288	25.051	24.241	36.812	-7.107	3.580
.9	1.236	-1.845	7.517	22.606	20.130	17.542	17.386	33.312	-13.917
1.0	-2.624	6.230	21.187	18.300	15.259	13.458	12.418	12.478	30.629
									FOUR BLADES
.2	16.644	-40.057	-26.762	26.572	37.262	43.608	38.580	-8.974	-15.363
.3	2.638	1.218	12.747	17.815	21.390	20.704	23.535	24.474	-9.613
.4	-8.615	46.511	41.859	2.925	4.688	8.175	7.539	26.606	50.980
.5	49.594	28.879	23.706	29.602	-7.584	-4.849	13.335	33.483	34.903
.6	25.877	19.040	15.327	12.939	21.071	-3.064	20.833	23.026	22.947
.7	16.642	12.598	9.000	5.602	17.522	46.724	5.406	11.970	13.217
.8	10.661	7.041	3.390	13.053	28.436	27.189	39.377	-5.526	4.121
.9	5.726	1.988	10.841	25.492	22.475	19.396	18.019	32.274	-11.193
1.0	.903	9.150	23.690	20.179	16.610	13.472	10.309	13.644	52.922

TABLE I, CONTINUED

MU = .4 PSI = 30 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	11.717	-23.006	-14.582	-8.440	-6.255	-5.063	-4.358	-3.889	-3.561
.3	3.385	13.943	-20.473	-12.714	-7.632	-5.696	-4.723	-4.158	-3.796
.4	1.994	3.626	15.901	-19.863	-11.464	-7.301	-5.622	-4.794	-4.330
.5	1.252	1.937	3.645	17.606	-21.294	-10.787	-7.465	-5.951	-5.224
.6	.682	1.005	1.641	3.355	18.997	-23.253	-10.748	-8.114	-6.840
.7	.133	.214	.421	.948	2.581	19.843	-26.214	-11.552	-9.517
.8	-.478	-.614	-.724	-.732	-.456	1.090	19.407	-31.054	-13.566
.9	-1.261	-1.673	-2.161	-2.611	-2.797	-3.420	-4.614	18.360	-33.078
1.0	-2.416	-3.318	-4.118	-4.826	-5.284	-6.441	-7.572	8.259	37.493

TWO BLADES

.2	-29.812	-51.379	-48.122	-26.760	-21.784	-16.585	-13.423	-11.278	-9.567
.3	34.567	40.454	14.960	3.174	-51.234	-24.264	-21.224	-17.278	-12.864
.4	17.396	20.337	32.422	-1.587	14.170	16.961	6.682	-25.399	-19.577
.5	11.515	12.271	14.153	28.969	-8.735	2.791	10.883	17.343	13.393
.6	8.321	8.612	9.344	11.277	27.547	-14.007	.029	4.683	7.296
.7	6.197	6.237	6.497	7.146	8.977	26.786	-18.587	-3.090	-.033
.8	4.531	4.364	4.278	4.346	4.791	6.592	25.309	-24.618	-6.562
.9	2.992	2.547	2.069	1.672	1.580	1.137	.150	23.457	-27.536
1.0	1.233	.314	-.483	-1.156	-1.559	-2.607	-3.594	12.441	41.952

THREE BLADES

.2	25.425	-4.466	58.106	-39.300	-34.373	-25.477	-19.646	-16.198	-14.169
.3	5.471	17.192	-11.951	-.689	1.481	-68.411	-29.397	-22.834	-18.607
.4	-3.846	-2.101	9.078	-25.215	-9.883	9.016	-10.590	-36.496	-30.982
.5	-11.092	-1.775	13.029	36.092	-.665	17.506	14.553	20.737	-35.004
.6	31.495	30.974	27.650	25.968	45.203	1.989	15.740	26.158	30.727
.7	20.102	19.391	17.175	17.315	19.552	36.803	-7.981	9.686	14.805
.8	13.951	12.687	11.706	11.693	12.130	13.868	32.989	-16.381	3.056
.9	9.801	8.749	7.921	7.355	7.082	6.731	6.004	29.681	-20.850
1.0	6.504	5.226	4.119	3.347	2.856	1.839	.942	17.146	46.980

FOUR BLADES

.2	-19.327	-25.209	.288	-72.812	-45.632	-32.687	-26.333	-21.967	-18.776
.3	38.957	47.452	25.673	23.869	-41.811	-52.452	-40.299	-31.856	-24.540
.4	18.444	22.140	35.292	3.683	28.509	29.805	-31.259	-49.742	-37.267
.5	9.604	9.712	10.221	26.144	-9.441	1.666	26.953	.081	-24.371
.6	2.184	-1.998	-3.502	4.799	31.512	-2.099	17.287	26.854	13.293
.7	-1.630	6.012	24.101	29.076	38.301	49.764	4.594	25.606	33.734
.8	31.423	29.021	22.219	21.692	22.255	22.844	41.933	-5.817	14.625
.9	22.816	17.571	15.310	14.314	13.788	13.186	12.196	36.666	-13.087
1.0	13.901	11.094	9.703	8.597	7.881	6.619	5.819	22.183	52.345

TABLE I, CONTINUED

MU = .4 PSI = 60 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	16.527	-19.668	-8.962	-5.370	-3.839	-2.995	-2.494	-2.138	-1.888
.3	5.169	18.361	-19.755	-8.214	-5.061	-3.627	-2.859	-2.382	-2.056
.4	3.238	5.339	20.140	-20.726	-7.671	-4.887	-3.501	-2.797	-2.329
.5	2.311	3.262	5.361	21.878	-22.191	-7.282	-4.766	-3.503	-2.803
.6	1.693	2.241	3.208	5.385	23.699	-23.974	-7.027	-4.756	-3.499
.7	1.216	1.565	2.066	2.876	5.293	25.485	-25.971	-6.933	-4.767
.8	.779	1.014	1.338	1.856	2.887	5.131	27.269	-28.128	-6.962
.9	.329	.480	.707	1.060	1.573	2.623	4.936	29.052	-30.406
1.0	-.162	-.080	.063	.294	.658	1.176	2.246	4.662	30.796

TWO BLADES

.2	7.297	-26.601	-14.405	-9.700	-7.517	-6.097	-5.183	-4.488	-3.966
.3	-7.457	9.081	-26.751	-13.766	-9.611	-7.401	-6.037	-5.119	-4.442
.4	-26.332	-9.201	8.865	-28.924	-13.889	-9.778	-7.536	-6.173	-5.197
.5	21.913	-2.202	-30.760	8.737	-31.698	-14.782	-10.428	-7.948	-6.441
.6	19.433	29.408	26.741	-6.352	9.934	-40.000	-15.959	-11.041	-8.286
.7	12.886	15.811	17.625	22.155	23.962	-14.256	-38.562	-16.422	-11.928
.8	9.321	10.163	11.668	13.856	20.334	32.439	34.889	-50.012	-17.618
.9	7.038	7.596	8.409	9.705	11.957	15.689	19.237	52.320	-31.446
1.0	5.364	5.704	6.225	7.017	8.241	9.923	12.248	17.042	44.902

THREE BLADES

.2	-7.737	-41.457	-23.183	-15.326	-11.398	-9.335	-7.860	-6.781	-5.978
.3	28.269	26.041	-49.157	-22.816	-15.464	-11.602	-9.249	-7.795	-6.721
.4	13.357	27.206	37.101	-53.802	-25.503	-16.663	-11.976	-9.542	-7.920
.5	6.893	10.925	16.827	41.164	-47.735	-33.863	-17.391	-12.450	-9.969
.6	2.018	3.960	7.488	13.890	49.154	-8.690	-24.925	-18.246	-13.358
.7	-4.276	-4.250	.596	4.245	10.903	38.781	-17.402	-42.065	-19.615
.8	-18.061	-6.343	-7.596	-2.379	-4.858	6.403	34.236	-.107	-23.151
.9	40.554	19.675	23.552	14.611	-7.167	2.624	2.131	32.972	-22.783
1.0	18.552	16.999	17.898	24.267	27.460	19.130	15.621	8.637	21.697

FOUR BLADES

.2	42.393	-83.014	-31.067	-20.448	-15.507	-12.456	-10.483	-9.045	-7.968
.3	7.577	35.701	-95.310	-32.517	-21.241	-15.489	-12.420	-10.382	-8.959
.4	-18.500	2.651	29.957	-30.407	-44.560	-22.244	-16.021	-12.760	-10.611
.5	26.545	4.218	-20.886	28.710	111.163	-36.831	-23.195	-16.866	-13.333
.6	21.992	32.980	31.951	2.193	27.648	-24.465	-38.053	-24.456	-17.823
.7	13.177	16.902	19.773	26.012	31.001	-2.309	-18.558	-66.313	-26.493
.8	6.604	8.358	10.655	13.759	22.153	37.186	43.684	-22.668	-32.761
.9	.285	1.886	3.260	2.919	8.994	15.595	21.606	58.639	-18.340
1.0	3.403	.858	1.455	-12.690	4.886	4.865	10.156	15.104	47.609

TABLE I, CONTINUED

MU = .4 PSI = 90 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	19.576	-18.043	-5.942	-3.530	-2.506	-1.958	-1.605	-1.358	-1.181
.3	7.153	20.806	-19.161	-5.770	-3.494	-2.450	-1.921	-1.569	-1.330
.4	4.554	7.076	22.227	-20.649	-5.646	-3.470	-2.429	-1.911	-1.553
.5	3.279	4.481	6.966	23.856	-22.372	-5.572	-3.454	-2.429	-1.917
.6	2.539	3.213	4.451	6.835	25.588	-24.278	-5.537	-3.450	-2.440
.7	2.037	2.493	3.137	4.332	6.698	27.404	-26.282	-5.536	-3.452
.8	1.605	1.936	2.411	3.044	4.242	6.571	29.302	-28.370	-5.590
.9	1.230	1.497	1.838	2.314	2.949	4.130	6.465	31.256	-30.517
1.0	.876	1.096	1.368	1.736	2.184	2.822	3.989	6.381	33.241

TWO BLADES

.2	15.596	-21.111	-8.428	-5.599	-4.263	-3.489	-2.952	-2.555	-2.258
.3	2.971	17.471	-21.868	-8.023	-5.406	-4.105	-3.368	-2.854	-2.472
.4	-.709	3.046	19.023	-23.273	-7.844	-5.346	-4.055	-3.339	-2.817
.5	-4.252	-.911	2.911	20.616	-25.031	-7.798	-5.351	-4.059	-3.354
.6	-9.223	-4.813	-1.279	2.428	22.170	-27.046	-7.828	-5.401	-4.124
.7	-16.125	-12.297	-7.432	-2.143	2.333	23.897	-29.193	-7.937	-5.477
.8	20.424	10.921	-20.318	-6.846	-2.493	1.797	25.419	-31.443	-8.111
.9	15.632	28.201	15.363	-10.802	-8.220	-3.316	.752	27.011	-33.794
1.0	10.879	13.903	16.067	25.839	-2.741	-8.260	-6.328	-.107	28.709

THREE BLADES

.2	5.843	-26.419	-11.985	-8.227	-6.357	-5.213	-4.416	-3.832	-3.380
.3	-17.866	9.067	-26.686	-11.252	-7.915	-6.102	-5.012	-4.263	-3.714
.4	20.125	-11.478	11.441	-27.996	-11.082	-7.784	-6.017	-4.974	-4.221
.5	21.966	27.355	-11.062	12.064	-29.833	-10.946	-7.830	-6.050	-5.008
.6	12.894	19.757	27.815	-30.871	13.427	-31.888	-11.187	-7.932	-6.132
.7	8.021	12.146	24.405	41.001	-9.147	16.037	-34.007	-11.340	-8.032
.8	4.183	6.894	11.248	18.135	16.437	-20.180	17.416	-36.465	-11.691
.9	-.017	2.959	5.789	9.409	14.464	41.537	-13.613	19.343	-39.357
1.0	-3.702	-1.344	1.371	4.222	7.451	13.233	17.434	-2.313	18.395

FOUR BLADES

.2	-21.135	-33.398	-15.900	-10.979	-8.476	-6.946	-5.884	-5.106	-4.514
.3	31.459	-4.153	-32.688	-15.034	-10.528	-8.140	-6.691	-5.687	-4.946
.4	17.246	43.084	-1.000	-34.364	-14.734	-10.274	-8.032	-6.632	-5.626
.5	6.329	16.814	41.801	-16.288	-36.477	-14.601	-10.426	-8.074	-6.672
.6	-2.103	5.583	19.852	69.043	2.337	-37.719	-14.792	-10.552	-8.205
.7	-11.192	-5.716	2.655	15.383	14.574	6.231	-39.717	-15.002	-10.753
.8	23.631	15.464	-14.322	2.348	11.311	33.110	-5.763	-42.087	-15.419
.9	17.242	30.809	19.214	-5.164	.018	9.529	45.636	8.766	-44.648
1.0	10.604	14.618	17.933	29.111	2.286	-.750	5.951	13.709	18.836

TABLE I, CONTINUED

MU = .4 PSI = 120 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	21.242	-15.087	-4.040	-2.336	-1.638	-1.247	-1.018	-.850	-.732
.3	10.036	21.119	-16.798	-4.154	-2.414	-1.679	-1.278	-1.030	-.861
.4	6.220	9.449	22.338	-18.710	-4.268	-2.478	-1.637	-1.310	-1.052
.5	4.490	6.026	8.909	23.602	-20.616	-4.339	-2.541	-1.768	-1.344
.6	3.498	4.356	5.771	8.496	25.142	-22.606	-4.476	-2.600	-1.771
.7	2.835	3.380	4.173	5.640	8.097	26.825	-24.664	-4.603	-2.648
.8	2.351	2.740	3.275	4.026	5.447	7.777	28.673	-26.774	-4.729
.9	1.953	2.252	2.635	3.170	3.753	5.218	7.516	30.582	-28.922
1.0	1.611	1.847	2.162	2.529	3.078	3.805	5.068	7.315	32.554

TWO BLADES

.2	19.405	-16.618	-5.298	-3.400	-2.557	-2.045	-1.731	-1.493	-1.315
.3	8.135	19.576	-18.085	-5.250	-3.361	-2.509	-2.019	-1.700	-1.463
.4	4.085	7.728	20.912	-19.916	-5.304	-3.381	-2.438	-2.020	-1.699
.5	1.861	3.953	7.228	22.203	-21.804	-5.370	-3.434	-2.567	-2.056
.6	-.055	1.723	3.687	6.798	23.733	-23.807	-5.511	-3.499	-2.580
.7	-2.302	-.268	1.441	3.493	6.359	25.374	-25.898	-5.672	-3.575
.8	-5.870	-2.762	-.549	1.188	3.235	5.979	27.177	-28.046	-5.829
.9	-11.346	-8.203	-3.203	-.763	.828	2.929	5.660	29.037	-30.239
1.0	27.576	-30.103	-8.167	-3.223	-.920	.805	2.703	5.398	30.965

THREE BLADES

.2	15.447	-19.117	-7.139	-4.824	-3.707	-3.016	-2.560	-2.212	-1.960
.3	2.971	16.431	-20.244	-6.881	-4.675	-3.595	-2.932	-2.495	-2.153
.4	-3.795	3.355	18.078	-21.951	-6.875	-4.651	-3.487	-2.919	-2.479
.5	-19.147	-3.384	3.171	19.498	-23.794	-6.912	-4.689	-3.603	-2.934
.6	12.383	-11.684	-2.746	2.925	21.075	-25.784	-7.061	-4.765	-3.635
.7	21.627	2.347	-10.495	-2.441	2.640	22.718	-27.871	-7.223	-4.857
.8	13.302	22.163	-2.014	-8.981	-2.880	2.077	24.480	-30.058	-7.406
.9	8.417	12.868	18.746	1.536	-12.154	-3.941	1.615	26.294	-32.278
1.0	5.700	8.499	12.698	22.955	-11.254	-19.979	-4.760	1.272	28.192

FOUR BLADES

.2	9.220	-22.392	-9.232	-6.350	-4.916	-4.009	-3.401	-2.954	-2.605
.3	-7.777	11.770	-22.764	-8.799	-6.109	-4.740	-3.891	-3.306	-2.877
.4	-21.220	-6.414	13.827	-24.482	-8.690	-6.038	-4.615	-3.861	-3.280
.5	47.398	-49.124	-5.235	15.602	-26.262	-8.699	-6.067	-4.738	-3.895
.6	15.109	24.894	-12.854	-3.700	17.413	-28.211	-8.827	-6.148	-4.770
.7	7.524	14.439	36.275	-25.892	-3.559	19.150	-30.308	-9.026	-6.254
.8	1.182	6.821	13.973	32.576	-14.061	-3.784	20.948	-32.496	-9.230
.9	-6.168	-1.389	6.210	13.418	13.914	-9.077	-4.682	22.599	-34.800
1.0	31.314	-25.144	-1.525	6.166	13.635	15.981	-17.420	-6.404	24.132

TABLE I, CONTINUED

MU = .4 PSI = 150 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	24.380	-10.828	-2.489	-1.383	-.935	-.700	-.556	-.458	-.388
.3	14.569	21.966	-12.871	-2.797	-1.531	-1.028	-.763	-.601	-.492
.4	8.557	13.672	21.517	-14.853	-3.065	-1.664	-1.121	-.826	-.648
.5	5.747	8.051	12.325	22.057	-16.941	-3.303	-1.799	-1.175	-.891
.6	4.653	5.584	7.626	11.168	23.147	-19.013	-3.521	-1.915	-1.288
.7	3.781	4.412	5.427	7.243	10.229	24.567	-21.114	-3.724	-2.020
.8	3.150	3.591	4.215	5.201	6.896	9.468	26.200	-23.246	-3.920
.9	2.680	3.000	3.405	4.037	4.999	6.573	8.868	27.977	-25.407
1.0	2.290	2.539	2.860	3.277	3.886	4.790	6.267	8.401	29.844

TWO BLADES

.2	23.681	-11.409	-2.980	-1.812	-1.314	-1.038	-.861	-.736	-.642
.3	13.884	21.383	-13.373	-3.229	-1.924	-1.376	-1.081	-.890	-.757
.4	7.757	13.003	20.943	-15.350	-3.505	-2.046	-1.469	-1.145	-.938
.5	4.722	7.212	11.632	21.459	-17.456	-3.751	-2.198	-1.532	-1.220
.6	3.267	4.493	6.736	10.420	22.524	-19.557	-3.997	-2.335	-1.665
.7	1.861	2.947	4.268	6.295	9.440	23.896	-21.689	-4.224	-2.474
.8	.408	1.586	2.669	3.976	5.896	8.635	25.498	-23.858	-4.459
.9	-1.623	.116	1.312	2.429	3.718	5.519	7.984	27.233	-26.056
1.0	-5.353	-1.834	-.092	1.111	2.218	3.446	5.169	7.481	29.050

THREE BLADES

.2	22.039	-12.533	-3.820	-2.475	-1.855	-1.493	-1.256	-1.078	-.948
.3	11.974	20.052	-14.362	-4.003	-2.544	-1.900	-1.521	-1.277	-1.093
.4	5.174	11.310	19.701	-16.291	-4.255	-2.673	-1.989	-1.589	-1.328
.5	.785	4.797	9.971	20.244	-18.411	-4.518	-2.828	-2.070	-1.675
.6	-3.750	.783	4.380	8.784	21.292	-20.526	-4.785	-2.990	-2.220
.7	-15.067	-3.475	.766	3.983	7.795	22.646	-22.682	-5.040	-3.147
.8	6.538	-9.230	-3.149	.527	3.584	6.958	24.205	-24.884	-5.295
.9	20.666	.021	-8.403	-2.755	.355	3.206	6.303	25.909	-27.096
1.0	13.523	22.520	-18.084	-8.820	-2.911	.147	2.838	5.739	27.703
.2	19.550	-13.993	-4.815	-3.214	-2.441	-1.976	-1.665	-1.436	-1.263
.3	8.372	18.049	-15.623	-4.927	-3.262	-2.474	-2.002	-1.683	-1.452
.4	-.797	8.383	17.908	-17.527	-5.181	-3.383	-2.574	-2.082	-1.747
.5	-10.188	-.129	7.259	18.510	-19.621	-5.435	-3.561	-2.664	-2.187
.6	2.780	-10.479	-.282	6.162	19.580	-21.748	-5.721	-3.740	-2.838
.7	33.552	-83.355	-12.079	-.667	5.184	20.923	-23.927	-6.001	-3.929
.8	14.564	32.969	-51.147	-11.511	-1.004	4.366	22.553	-26.161	-6.291
.9	7.802	14.122	25.071	-15.199	-9.388	-1.214	3.688	24.158	-28.416
1.0	1.757	7.354	13.482	18.677	-6.857	-7.517	-1.335	3.169	25.910

TABLE I, CONTINUED

MU = .4 PSI = 180 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	39.339	-5.269	-1.035	-.499	-.291	-.198	-.142	-.105	-.082
.3	23.166	28.293	-7.663	-1.487	-.728	-.429	-.300	-.215	-.163
.4	12.254	20.268	23.505	-9.865	-1.891	-.937	-.560	-.393	-.288
.5	8.346	10.769	17.900	21.765	-12.130	-2.248	-1.129	-.680	-.479
.6	6.324	7.492	9.820	15.735	21.553	-14.288	-2.568	-1.296	-.789
.7	5.034	5.647	6.857	9.090	13.848	22.182	-16.430	-2.854	-1.456
.8	4.159	4.599	5.336	6.395	8.429	12.309	23.309	-18.590	-3.114
.9	3.537	3.879	4.336	4.962	6.027	8.021	11.098	24.742	-20.756
1.0	3.048	3.302	3.632	4.073	4.688	5.705	7.609	10.145	26.378

TWO BLADES

.2	39.588	-5.110	-.932	-.428	-.241	-.161	-.115	-.085	-.066
.3	23.347	28.403	-7.593	-1.440	-.699	-.408	-.288	-.208	-.161
.4	12.310	20.267	23.513	-9.872	-1.905	-.953	-.575	-.410	-.305
.5	8.219	10.656	17.802	21.681	-12.209	-2.317	-1.186	-.735	-.529
.6	5.962	7.206	9.587	15.539	21.388	-14.431	-2.689	-1.400	-.879
.7	4.363	5.130	6.449	8.756	13.572	21.954	-16.624	-3.020	-1.603
.8	3.070	3.780	4.702	5.883	8.015	11.961	23.034	-18.838	-3.325
.9	1.871	2.651	3.392	4.216	5.441	7.543	10.696	24.399	-21.052
1.0	.519	1.485	2.275	3.024	3.856	5.029	7.050	9.691	25.981

THREE BLADES

.2	39.492	-5.203	-.998	-.477	-.285	-.196	-.143	-.105	-.089
.3	22.999	28.173	-7.764	-1.571	-.801	-.490	-.352	-.263	-.202
.4	11.620	19.815	23.165	-10.125	-2.100	-1.109	-.694	-.513	-.390
.5	7.010	9.840	17.224	21.254	-12.532	-2.578	-1.392	-.899	-.669
.6	3.955	5.874	8.660	14.866	20.881	-14.823	-3.000	-1.644	-1.086
.7	.809	2.961	4.989	7.745	12.833	21.373	-17.076	-3.388	-1.902
.8	-3.124	.239	2.414	4.347	6.913	11.133	22.373	-19.345	-3.739
.9	-8.831	-3.488	-.290	1.987	3.800	6.343	9.789	23.693	-21.614
1.0	17.819	-9.593	-3.745	-.700	1.536	3.328	5.800	8.723	25.223

FOUR BLADES

.2	38.537	-5.441	-1.151	-.585	-.356	-.250	-.186	-.141	-.111
.3	22.121	27.668	-8.102	-1.804	-.964	-.612	-.447	-.336	-.262
.4	10.069	18.844	22.569	-10.544	-2.397	-1.331	-.870	-.649	-.500
.5	4.100	8.147	16.227	20.563	-13.027	-2.936	-1.667	-1.118	-.837
.6	-1.861	2.986	6.913	13.737	20.105	-15.389	-3.427	-1.990	-1.350
.7	-17.404	-2.908	2.101	5.911	11.608	20.535	-17.707	-3.864	-2.284
.8	66.025	-20.429	-3.591	1.372	5.009	9.852	21.474	-20.043	-4.278
.9	22.770	72.149	-23.387	-4.446	.762	4.384	8.451	22.724	-22.362
1.0	13.023	22.833	78.708	-26.432	-5.277	.163	3.808	7.315	24.189

TABLE I, CONTINUED

MU = .4 PSI = 210 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-.973	.616	.476	.397	.344	.304	.273	.248	.228
.3	49.013	97.323	-2.179	-.145	.080	.144	.163	.168	.167
.4	23.414	28.291	51.207	-4.874	-.712	-.211	-.043	.029	.067
.5	12.941	15.921	22.239	33.005	-7.314	-1.221	-.485	-.222	-.096
.6	8.948	10.312	12.763	19.825	25.930	-9.620	-1.666	-.649	-.384
.7	6.924	7.519	8.829	11.068	17.544	23.262	-11.842	-2.039	-.935
.8	5.604	6.056	6.769	7.699	9.989	14.927	22.586	-14.013	-2.398
.9	4.675	4.988	5.437	5.908	7.162	9.094	13.723	22.924	-16.180
1.0	4.002	4.223	4.531	4.956	5.607	6.647	8.633	12.322	23.890

TWO BLADES

.2	.168	1.468	1.146	.946	.807	.701	.617	.557	.504
.3	49.945	98.051	-1.592	.346	.497	.508	.482	.453	.425
.4	24.158	28.880	51.700	-4.450	-.347	.100	.241	.285	.299
.5	13.490	16.370	22.626	33.332	-7.021	-.963	-.250	-.007	.099
.6	9.285	10.589	13.010	20.048	26.131	-9.432	-1.487	-.488	-.232
.7	7.013	7.612	8.924	11.165	17.639	23.355	-11.735	-1.942	-.838
.8	5.410	5.908	6.675	7.641	9.959	14.916	22.595	-13.990	-2.368
.9	4.107	4.557	5.110	5.659	6.987	8.954	13.620	22.850	-16.226
1.0	2.967	3.427	3.911	4.473	5.225	6.355	8.393	12.135	23.740

THREE BLADES

.2	1.282	2.300	1.796	1.467	1.234	1.068	.946	.845	.766
.3	50.791	98.710	-1.062	.783	.871	.834	.772	.712	.660
.4	24.682	29.316	52.066	-4.142	-.068	.364	.467	.496	.498
.5	13.626	16.525	22.782	33.501	-6.860	-.799	-.100	.135	.246
.6	8.929	10.401	12.903	20.004	26.134	-9.402	-1.434	-.411	-.153
.7	6.012	6.929	8.465	10.853	17.437	23.235	-11.815	-1.971	-.852
.8	3.414	4.523	5.703	6.965	9.486	14.580	22.357	-14.162	-2.480
.9	.604	2.087	3.409	4.461	6.126	8.331	13.167	22.509	-16.475
1.0	-3.496	-.762	1.042	2.462	3.820	5.323	7.643	11.573	23.309

FOUR BLADES

.2	2.586	3.168	2.432	1.976	1.666	1.436	1.260	1.131	1.015
.3	51.523	99.279	-.588	1.181	1.215	1.137	1.041	.956	.882
.4	24.922	29.548	52.315	-3.893	.157	.570	.678	.684	.675
.5	13.215	16.315	22.714	33.513	-6.806	-.712	.010	.255	.356
.6	7.582	9.512	12.392	19.715	25.967	-9.471	-1.455	-.410	-.116
.7	2.653	4.981	7.267	10.098	16.953	22.914	-12.003	-2.105	-.921
.8	-5.478	.168	3.304	5.465	8.505	13.928	21.915	-14.461	-2.690
.9	-4.511	-10.825	-1.836	1.659	4.491	7.201	12.370	21.951	-16.874
1.0	21.899	-3.061	-18.505	-3.405	.693	3.369	6.310	10.651	22.648

TABLE I, CONTINUED

MU = .4 PSI = 240 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-81.783	6.536	2.240	1.438	1.088	.884	.747	.655	.582
.3	-71.436	-181.925	3.000	1.360	.991	.802	.685	.602	.538
.4	34.490	123.883	224.408	-.517	.520	.569	.531	.493	.460
.5	29.119	25.482	33.514	94.803	-3.660	-.252	.166	.278	.313
.6	14.636	15.350	17.356	22.255	49.661	-6.352	-.913	-.191	.047
.7	10.176	10.412	11.362	13.264	18.053	33.373	-8.709	-1.472	-.506
.8	7.797	7.984	8.458	9.376	11.187	15.787	26.965	-10.770	-1.943
.9	6.291	6.408	6.557	7.176	8.085	9.761	13.799	24.565	-12.990
1.0	5.259	5.341	5.521	5.857	6.402	7.263	8.982	12.672	23.980

TWO BLADES

.2	-79.701	8.137	3.533	2.517	2.006	1.689	1.457	1.289	1.154
.3	-69.734	-180.554	4.144	2.329	1.837	1.548	1.350	1.200	1.079
.4	35.905	125.062	225.407	.351	1.281	1.230	1.140	1.043	.957
.5	30.287	26.464	34.360	95.541	-3.013	.348	.706	.766	.768
.6	15.562	16.161	18.040	22.873	50.218	-5.861	-.447	.238	.444
.7	10.859	11.012	11.902	13.742	18.486	33.776	-8.332	-1.114	-.174
.8	8.232	8.352	8.787	9.687	11.491	16.064	27.230	-10.515	-1.690
.9	6.427	6.527	6.678	7.298	8.216	9.903	13.956	24.714	-12.835
1.0	5.046	5.162	5.383	5.747	6.328	7.224	8.978	12.688	24.011

THREE BLADES

.2	-77.172	9.937	4.968	3.678	2.982	2.520	2.178	1.932	1.736
.3	-67.741	-178.999	5.400	3.376	2.725	2.317	2.016	1.806	1.625
.4	37.471	126.320	226.461	1.235	2.052	1.919	1.752	1.593	1.462
.5	31.437	27.421	35.189	96.269	-2.354	.909	1.230	1.241	1.211
.6	16.296	16.764	18.603	23.377	50.672	-5.424	-.061	.606	.800
.7	11.112	11.250	12.114	13.976	18.734	34.008	-8.083	-.866	.076
.8	7.882	8.092	8.602	9.559	11.426	16.084	27.297	-10.420	-1.561
.9	5.224	5.535	5.900	6.714	7.785	9.596	13.751	24.598	-12.883
1.0	2.525	3.068	3.752	4.482	5.350	6.493	8.436	12.304	23.757

FOUR BLADES

.2	-74.262	12.001	6.467	4.869	3.959	3.355	2.909	2.581	2.313
.3	-65.533	-177.353	6.702	4.440	3.620	3.092	2.709	2.408	2.166
.4	39.083	127.623	227.516	2.136	2.822	2.590	2.334	2.132	1.950
.5	32.479	28.293	35.931	96.918	-1.793	1.442	1.708	1.698	1.626
.6	16.689	17.160	18.937	23.711	51.017	-5.083	.281	.957	1.128
.7	10.652	10.903	11.927	13.882	18.751	34.122	-7.950	-.669	.289
.8	6.135	6.612	7.577	8.848	10.979	15.808	27.167	-10.455	-1.530
.9	1.474	2.091	3.167	4.883	6.639	8.789	13.216	24.268	-13.077
1.0	-4.860	-2.901	-3.294	.180	2.775	4.761	7.361	11.555	23.222

TABLE I. CONTINUED

MU = .4 PSI = 270 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-23.803	15.325	4.940	2.924	2.113	1.679	1.393	1.201	1.060
.3	-13.553	-33.730	10.860	3.551	2.232	1.684	1.377	1.174	1.024
.4	-16.633	-38.681	-82.344	3.612	2.013	1.522	1.252	1.077	.952
.5	-52.052	30.989	48.583	57.988	-2.935	.618	.856	.849	.793
.6	27.335	26.986	21.720	23.306	38.750	-6.869	-.546	.282	.491
.7	17.034	15.126	13.966	14.403	17.142	31.315	-9.042	-1.440	-.217
.8	11.765	10.643	10.247	10.356	11.337	14.281	26.994	-10.694	-2.076
.9	8.817	8.223	8.018	8.080	8.391	9.707	12.647	24.965	-12.381
1.0	7.064	6.661	6.560	6.532	6.806	7.369	8.662	11.565	24.222

TWO BLADES

.2	-20.596	17.858	7.025	4.689	3.639	3.016	2.587	2.269	2.023
.3	-10.946	-31.584	12.685	5.131	3.622	2.916	2.491	2.185	1.945
.4	-14.467	-36.842	-80.750	5.021	3.265	2.632	2.270	2.012	1.814
.5	-50.224	32.567	49.975	59.230	-1.819	1.613	1.772	1.701	1.573
.6	28.856	28.325	22.911	24.366	39.714	-5.988	.256	1.033	1.190
.7	18.297	16.245	14.963	15.286	17.934	32.052	-8.366	-.808	.372
.8	12.777	11.500	11.015	11.048	11.961	14.861	27.527	-10.198	-1.612
.9	9.538	8.833	8.560	8.564	8.812	10.089	12.998	25.305	-12.064
1.0	7.506	7.008	6.817	6.748	6.982	7.518	8.797	11.697	24.360

THREE BLADES

.2	-16.276	20.964	9.474	6.683	5.321	4.464	3.849	3.392	3.041
.3	-7.641	-28.939	14.839	6.931	5.171	4.268	3.671	3.253	2.912
.4	-11.774	-34.646	-78.896	6.608	4.653	3.870	3.355	2.990	2.696
.5	-48.060	34.387	51.513	60.583	-.632	2.694	2.731	2.571	2.372
.6	30.563	29.766	24.144	25.441	40.670	-5.125	1.031	1.753	1.855
.7	19.528	17.272	15.836	16.047	18.588	32.646	-7.810	-.266	.895
.8	13.504	12.083	11.418	11.358	12.273	15.129	27.794	-9.924	-1.308
.9	9.733	8.822	8.448	8.390	8.613	9.923	12.880	25.241	-12.053
1.0	6.933	6.221	5.929	5.805	6.066	6.691	8.137	11.145	23.948

FOUR BLADES

.2	-11.130	24.520	12.115	8.789	7.050	5.931	5.127	4.526	4.045
.3	-3.647	-25.955	17.166	8.852	6.779	5.645	4.898	4.329	3.878
.4	-8.724	-32.198	-76.901	8.282	6.084	5.105	4.463	3.987	3.607
.5	-45.710	36.308	53.124	61.939	.551	3.736	3.686	3.441	3.173
.6	32.266	31.143	25.296	26.433	41.552	-4.329	1.783	2.452	2.527
.7	20.584	18.084	16.433	16.555	19.036	33.074	-7.384	.162	1.339
.8	13.786	12.088	11.317	11.144	12.072	14.991	27.751	-9.826	-1.161
.9	8.823	7.729	7.125	6.963	7.251	8.846	12.058	24.711	-12.352
1.0	3.664	3.123	2.810	1.987	2.171	3.894	5.976	9.554	22.836

TABLE I, CONTINUED

MU = .4 PSI = 300 ONE BLADE

X	XP .15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-10.028	56.112	12.050	6.276	4.167	3.152	2.549	2.152	1.866
.3	-5.050	-10.152	59.052	9.975	4.935	3.355	2.574	2.134	1.834
.4	-5.564	-9.392	-20.929	-16.404	4.849	3.136	2.400	1.990	1.712
.5	-8.104	-17.681	1.650	43.287	-22.756	.709	1.597	1.626	1.454
.6	-13.213	-.612	32.404	22.175	27.109	-16.211	-1.501	.497	.916
.7	3.006	23.208	12.359	14.901	14.987	23.847	-13.182	-2.710	-.279
.8	23.847	15.790	17.513	11.115	8.566	12.250	22.911	-12.751	-3.382
.9	13.818	11.051	9.551	8.820	10.686	8.989	10.874	22.934	-13.597
1.0	10.042	8.627	7.751	7.297	7.122	7.299	8.031	10.060	23.491

TWO BLADES

.2	-5.179	59.994	15.303	9.085	6.639	5.360	4.541	3.963	3.526
.3	-1.236	-6.939	61.841	12.440	7.137	5.360	4.404	3.811	3.379
.4	-2.436	-6.666	-18.514	-14.231	6.820	4.939	4.059	3.520	3.142
.5	-5.463	-15.340	3.751	45.200	-21.018	2.312	3.096	3.013	2.733
.6	-10.968	1.384	34.234	23.814	28.619	-14.805	-.221	1.691	2.033
.7	4.923	24.937	13.662	16.322	16.260	25.023	-12.096	-1.707	.636
.8	25.468	17.224	19.046	12.287	9.344	13.182	23.754	-11.990	-2.703
.9	15.157	12.233	10.575	9.719	11.742	9.650	11.440	23.403	-13.208
1.0	11.092	9.493	8.495	7.900	7.582	7.631	8.241	10.159	23.495

THREE BLADES

.2	1.952	64.927	19.339	12.417	9.480	7.835	6.721	5.909	5.249
.3	4.157	-2.739	65.295	15.400	9.731	7.631	6.451	5.642	5.044
.4	1.833	-3.193	-15.551	-11.649	9.116	6.998	5.916	5.203	4.665
.5	-2.030	-12.447	6.260	47.405	-19.040	4.087	4.685	4.459	4.091
.6	-8.188	3.776	36.303	25.661	30.241	-13.361	1.082	2.853	3.093
.7	7.182	26.829	14.801	17.731	17.479	26.065	-11.237	-.967	1.303
.8	27.208	18.672	20.720	13.195	9.302	13.662	24.033	-11.879	-2.644
.9	16.388	13.149	11.215	10.014	12.402	9.321	10.811	22.576	-14.199
1.0	11.782	9.819	8.411	7.438	6.505	6.027	6.226	7.762	20.633

FOUR BLADES

.2	11.877	71.181	23.806	16.016	12.472	10.396	8.955	7.867	7.039
.3	11.353	2.221	69.224	18.644	12.500	10.050	8.552	7.531	6.737
.4	7.163	.901	-12.215	-8.813	11.557	9.153	7.842	6.925	6.225
.5	2.084	-9.184	9.002	49.767	-16.992	5.898	6.323	5.944	5.409
.6	-5.028	6.369	38.478	27.461	31.790	-12.080	2.235	3.871	4.068
.7	9.591	28.800	15.640	18.914	18.333	26.599	-10.835	-.697	1.541
.8	28.939	19.913	22.240	13.538	7.591	13.014	22.916	-13.094	-3.868
.9	17.389	13.602	10.919	9.036	12.227	6.322	6.363	18.691	-18.814
1.0	11.946	9.003	6.179	3.521	2.642	2.196	-6.108	8.361	21.024

TABLE I, CONTINUED

MU = .4 PSI = 330 ONE BLADE

XP

X	.15	.25	.35	.45	.55	.65	.75	.85	.95
.2	-1.617	4.590	64.656	39.557	16.788	9.511	6.496	5.032	4.091
.3	-1.087	.499	-152.168	-52.034	3.471	11.624	6.883	4.961	3.917
.4	-1.555	-2.010	.354	-62.861	7.753	9.374	5.733	4.315	3.480
.5	-2.471	-3.997	-7.430	1.264	-5.106	1.406	2.984	3.015	2.753
.6	-4.050	-7.624	-18.831	33.046	29.478	-9.532	-3.158	.765	1.687
.7	-6.706	-11.177	18.563	19.212	15.953	24.238	-11.147	-4.070	-.369
.8	-10.568	14.862	17.839	13.675	11.773	12.166	23.793	-12.877	-4.333
.9	8.679	17.715	13.021	10.587	9.419	9.309	10.558	24.307	-14.840
1.0	20.829	12.966	10.000	8.516	7.891	7.670	8.035	9.605	25.306

TWO BLADES

.2	6.134	10.824	70.056	44.314	21.132	13.510	10.215	8.524	7.386
.3	4.663	5.400	-147.767	-48.034	7.169	15.082	10.152	8.070	6.892
.4	3.001	2.049	4.041	-59.449	10.942	12.396	8.604	7.064	6.124
.5	1.294	-.570	-4.272	4.208	-2.335	4.041	5.491	5.417	5.059
.6	-.850	-4.703	-16.108	35.598	31.880	-7.260	-1.014	2.814	3.624
.7	-3.963	-8.644	20.921	21.429	18.011	26.144	-9.357	-2.401	1.140
.8	-8.205	17.032	19.863	15.536	13.492	13.755	25.225	-11.662	-3.300
.9	10.703	19.569	14.722	12.139	10.811	10.503	11.565	25.055	-14.392
1.0	22.538	14.481	11.392	9.717	8.914	8.461	8.531	9.764	24.978

THREE BLADES

.2	20.871	20.456	77.458	50.503	26.530	18.356	14.696	12.648	11.214
.3	14.733	12.717	-141.874	-42.935	11.808	19.355	14.163	11.882	10.500
.4	10.269	7.654	8.856	-55.160	14.883	16.072	12.085	10.376	9.285
.5	6.836	4.032	-.259	7.822	.982	7.131	8.397	8.123	7.608
.6	3.563	-.939	-12.762	38.614	34.633	-4.774	1.257	4.792	5.257
.7	-.374	-5.535	23.677	23.873	20.150	28.033	-7.885	-1.476	1.288
.8	-5.284	19.591	22.077	17.429	15.025	14.847	25.695	-12.090	-5.325
.9	13.058	21.557	16.385	13.387	11.559	10.527	10.562	22.653	-16.893
1.0	24.381	15.993	12.423	10.224	8.627	7.003	4.751	6.908	35.880

FOUR BLADES

.2	47.684	34.926	86.502	57.496	32.540	23.797	19.543	17.049	15.138
.3	35.658	22.985	-134.573	-36.984	16.975	24.176	18.727	16.174	14.497
.4	22.133	15.299	14.576	-50.228	19.308	20.178	16.015	14.162	12.909
.5	14.618	9.624	4.384	11.815	4.609	10.438	11.436	10.907	9.791
.6	9.083	3.491	-9.067	41.835	37.418	-2.369	3.077	5.725	4.546
.7	3.888	-2.071	26.594	26.331	22.107	29.227	-7.822	-3.017	3.015
.8	-1.991	22.266	24.242	19.029	15.875	14.457	22.686	-13.569	18.049
.9	15.559	23.517	17.713	13.923	10.968	8.481	12.306	48.113	7.098
1.0	26.133	17.150	12.639	9.155	6.441	8.619	26.590	28.984	41.529

TABLE II-A

$\frac{4\pi B}{\Gamma_0}(V_i)_0$ VERSUS XP AND PSI

ROOT AND TIP VORTICES

MU = .2 ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	.990	-2.502	-1.007	-3.847	-30.317	-35.051	-59.515
.25	56.313	36.987	34.048	15.024	9.551	10.006	7.941
.35	38.342	20.425	22.323	-15.672	2.446	3.629	3.524
.45	-13.736	16.561	20.684	-6.586	2.218	3.214	3.404
.55	-17.476	15.284	19.688	-1.702	2.704	3.577	3.791
.65	-11.460	14.873	20.296	.127	3.334	4.359	4.453
.75	-7.781	14.954	25.928	1.894	4.883	5.749	6.220
.85	-1.000	16.247	40.335	5.013	7.299	8.178	8.847
.95	25.262	36.563	35.298	28.332	29.187	28.141	26.500

	180	210	240	270	300	330	360
.15	-59.515	-101.299	-148.086	79.919	31.206	9.370	.990
.25	7.941	5.236	2.232	-1.558	-9.644	110.970	56.313
.35	3.524	2.598	2.203	.849	-1.664	-10.073	38.342
.45	3.404	3.236	2.773	1.800	.008	-3.902	-13.736
.55	3.791	3.829	3.490	2.607	.869	-2.425	-17.476
.65	4.453	4.531	4.454	3.526	1.637	-1.786	-11.460
.75	6.220	6.247	6.017	5.035	2.831	-.600	-7.781
.85	8.847	9.267	9.018	7.892	5.397	4.954	-1.000
.95	26.500	25.017	23.997	23.139	21.460	28.344	25.262

TWO BLADES

	0	30	60	90	120	150	180
.15	-15.979	-37.085	26.644	7.595	-20.808	-24.863	-47.195
.25	48.293	-10.576	50.436	24.688	19.363	22.761	25.730
.35	42.357	-16.067	33.558	-6.505	14.259	21.971	45.247
.45	-12.260	48.192	29.508	2.962	19.553	14.471	-13.314
.55	-19.566	45.498	27.348	8.762	47.445	-7.925	-3.429
.65	-19.236	40.304	27.753	13.930	-14.337	-2.835	.080
.75	-27.578	37.276	33.833	23.968	-6.126	1.360	3.214
.85	29.445	37.031	49.816	27.100	1.235	5.231	6.678
.95	58.655	57.111	48.870	-2.911	25.292	26.036	24.864

	180	210	240	270	300	330	360
.15	-47.195	-85.093	-127.971	98.030	52.252	4.132	-15.979
.25	25.730	25.684	31.935	16.862	9.337	123.379	48.293
.35	45.247	-19.018	7.033	33.454	12.073	-.046	42.357
.45	-13.314	-7.981	-11.795	21.902	13.112	3.671	-12.260
.55	-3.429	-3.225	-7.605	10.488	13.374	3.816	-19.566
.65	.080	.212	-2.661	-36.962	14.244	3.666	-19.236
.75	3.214	3.200	1.665	-7.777	16.714	4.595	-27.578
.85	6.678	7.047	5.876	-.350	20.771	10.234	29.445
.95	24.864	23.318	21.624	17.380	42.187	33.956	58.655

TABLE II-A, CONTINUED

MU = .2 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	-14.016	4.741	-54.652	32.815	-5.483	-7.668	-33.056
.25	42.133	57.763	77.608	37.668	34.200	32.888	4.508
.35	21.939	20.298	45.745	4.627	35.788	.482	9.071
.45	-30.239	94.154	37.959	15.091	9.927	10.359	16.793
.55	-47.029	63.232	34.762	26.300	3.989	28.274	65.699
.65	36.793	50.857	34.413	31.155	14.010	30.830	-20.027
.75	26.759	46.033	41.347	9.679	34.672	-20.763	-3.170
.85	2.565	48.888	60.046	14.760	-9.918	-1.411	2.900
.95	2.822	71.531	60.912	-90.529	19.322	22.501	22.449

	180	210	240	270	300	330	360
.15	-33.056	-104.693	-155.280	77.350	26.318	5.079	-14.016
.25	4.508	6.817	1.769	-3.065	-17.150	106.273	42.133
.35	9.071	11.272	8.036	-.807	-6.015	-11.184	21.939
.45	16.793	18.868	14.870	4.327	-.108	3.618	-30.239
.55	65.699	17.904	40.952	9.345	8.287	8.977	-47.029
.65	-20.027	-27.404	1.608	14.816	18.100	9.707	36.793
.75	-3.170	-5.045	-9.466	24.190	24.005	10.939	26.759
.85	2.900	2.963	-.072	3.229	26.852	16.709	2.565
.95	22.449	20.727	17.890	-2.144	34.523	40.779	2.822

FOUR BLADES

	0	30	60	90	120	150	180
.15	-57.610	-17.362	-3.568	57.089	15.951	-3.960	-58.150
.25	21.821	-3.447	155.780	53.030	49.351	19.376	26.708
.35	15.856	18.660	53.083	17.178	14.785	23.429	50.669
.45	-55.527	105.671	31.721	29.920	8.262	20.482	-3.827
.55	27.110	85.530	39.875	35.440	50.126	2.560	15.072
.65	18.823	73.013	40.700	14.612	-5.020	15.957	126.537
.75	-20.271	66.693	50.147	25.927	9.897	-12.727	-48.921
.85	17.700	65.339	68.959	38.641	-2.830	-8.550	-4.707
.95	47.534	86.661	77.117	.307	12.572	18.725	18.945

	180	210	240	270	300	330	360
.15	-58.150	-86.132	-128.670	95.605	47.697	-7.359	-57.610
.25	26.708	28.422	34.237	16.590	6.840	114.764	21.821
.35	50.669	-13.062	12.038	35.165	10.341	-8.537	15.856
.45	-3.827	2.421	-3.613	25.541	11.778	-1.986	-55.527
.55	15.072	13.502	4.959	16.138	13.178	7.866	27.110
.65	126.537	62.785	22.862	-28.079	13.702	14.235	18.823
.75	-48.921	-20.230	49.420	6.160	10.136	16.955	-20.271
.85	-4.707	-2.269	-13.274	23.357	19.749	22.873	17.700
.95	18.945	17.435	12.876	-30.333	46.981	47.837	47.534

TABLE II-A, CONTINUED

MU = .3

ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	7.285	-5.489	-20.049	-19.846	-21.529	-27.602	-60.211
.25	70.013	45.478	14.530	16.387	15.341	12.417	8.525
.35	31.389	29.409	3.254	6.093	5.642	5.077	4.437
.45	24.941	23.995	1.061	4.160	4.447	4.371	4.274
.55	25.154	19.800	.293	3.805	4.331	4.528	4.654
.65	30.021	17.863	-.121	3.948	4.732	5.178	5.465
.75	5.154	17.899	.253	5.002	5.810	6.446	7.084
.85	-9.461	4.373	3.550	7.139	8.016	8.713	9.680
.95	12.949	40.664	28.282	31.907	31.424	29.308	26.615

	180	210	240	270	300	330	360
.15	-60.211	-578.160	83.536	36.091	17.558	9.657	7.285
.25	8.525	4.566	.296	-7.145	-43.512	286.284	70.013
.35	4.437	3.812	2.945	1.332	-3.758	84.280	31.389
.45	4.274	4.146	3.828	2.959	.793	-15.562	24.941
.55	4.654	4.728	4.510	3.921	2.449	-3.401	25.154
.65	5.465	5.665	5.554	4.891	3.520	.146	30.021
.75	7.084	7.435	7.206	6.374	4.936	2.293	5.154
.85	9.680	10.654	10.598	9.322	7.440	4.974	-9.461
.95	26.615	24.502	23.630	22.777	22.348	21.949	12.949

TWO BLADES

	0	30	60	90	120	150	180
.15	-4.900	-39.577	-2.977	-8.291	-7.861	-9.244	-71.732
.25	59.203	-1.916	28.052	27.641	32.246	4.662	2.221
.35	21.020	57.631	14.842	18.014	35.882	-2.944	.325
.45	14.411	57.700	11.559	18.515	-14.289	-.285	1.498
.55	13.825	40.707	10.369	26.841	-4.014	1.410	2.666
.65	17.288	33.828	10.024	26.853	-.716	2.989	3.972
.75	-9.391	30.155	11.335	-.374	2.191	4.834	5.926
.85	-22.001	11.490	16.770	-2.444	5.587	7.468	8.758
.95	5.864	49.645	43.932	26.012	29.595	28.323	25.863

	180	210	240	270	300	330	360
.15	-71.732	-584.605	78.386	31.351	12.300	2.686	-4.900
.25	2.221	.204	-3.711	-11.357	-48.363	280.154	59.203
.35	.325	.658	-.249	-2.487	-8.489	78.277	21.020
.45	1.498	1.815	1.280	-.461	-4.057	-21.872	14.411
.55	2.666	2.939	2.418	.916	-2.791	-11.235	13.825
.65	3.972	4.259	3.843	2.239	-2.231	-10.890	17.288
.75	5.926	6.315	5.790	4.025	-1.015	-7.098	-9.391
.85	8.758	9.742	9.430	7.288	1.553	15.772	-22.001
.95	25.863	23.743	22.651	21.026	16.167	35.340	5.864

TABLE II-A, CONTINUED

MU = .3 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	-36.023	-6.418	-28.543	16.788	-21.130	-21.745	-49.928
.25	35.045	32.318	61.106	53.530	15.034	21.838	24.280
.35	1.013	.502	30.408	51.579	11.543	19.838	41.112
.45	-5.183	107.632	24.207	11.869	15.623	19.663	-12.903
.55	-.304	53.754	22.255	2.594	24.550	-6.650	-3.440
.65	15.660	42.928	22.871	10.749	9.279	-3.732	.397
.75	-25.217	37.437	26.137	25.416	-6.102	1.005	3.538
.85	8.297	17.040	31.123	105.019	.204	5.022	7.075
.95	37.170	54.415	68.820	4.636	26.341	26.608	24.620

	180	210	240	270	300	330	360
.15	-49.928	-558.773	94.193	17.823	-.668	-10.679	-36.023
.25	24.280	18.296	-17.440	-20.551	-62.730	268.636	35.045
.35	41.112	-18.624	-11.240	-28.742	-15.911	66.176	1.013
.45	-12.903	-6.169	-6.947	-9.906	3.921	-14.859	-5.183
.55	-3.440	-2.205	-3.859	-9.178	27.702	6.334	-.304
.65	.397	1.020	-.393	-8.546	19.414	6.500	15.660
.75	3.538	4.129	2.916	-3.452	21.664	6.097	-25.217
.85	7.075	8.152	7.413	2.552	30.968	8.071	8.297
.95	24.620	22.542	21.097	17.639	42.875	24.586	37.170

FOUR BLADES

	0	30	60	90	120	150	180
.15	10.966	-42.754	-43.893	37.546	3.024	-.287	-63.375
.25	75.214	-14.697	90.336	31.605	39.951	13.457	12.529
.35	-33.585	14.761	46.922	20.262	43.526	7.317	15.179
.45	-.388	97.750	37.696	21.394	-5.130	13.430	39.070
.55	-10.275	65.420	36.232	31.160	8.679	26.097	-124.820
.65	-10.063	52.408	40.142	33.640	27.254	-19.568	-12.669
.75	22.257	46.238	37.077	11.753	85.648	-5.641	-.985
.85	-.189	22.620	49.906	28.837	-21.284	1.483	4.601
.95	24.097	70.119	52.044	-100.785	20.477	24.382	22.960

	180	210	240	270	300	330	360
.15	-63.375	-575.730	89.023	48.538	6.589	-36.228	10.966
.25	12.529	12.887	10.444	4.100	-37.149	263.146	75.214
.35	15.179	25.483	25.123	12.981	5.175	90.690	-33.585
.45	39.070	29.767	27.454	22.704	7.099	-16.734	-.388
.55	-124.820	-10.049	-15.575	22.641	7.579	-8.527	-10.275
.65	-12.669	-4.849	-8.462	26.167	8.493	-8.950	-10.063
.75	-.985	.881	-2.505	-18.848	10.462	-5.122	22.257
.85	4.601	5.922	4.077	-10.732	14.863	18.362	-.189
.95	22.960	20.975	18.961	12.266	32.803	38.888	24.097

TABLE II-A, CONTINUED

MU = .4

ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	-13.833	-14.134	-16.689	-18.700	-19.730	-22.089	-36.291
.25	44.336	19.687	19.588	19.139	16.935	13.367	8.572
.35	42.137	10.464	9.025	7.311	6.203	5.349	4.668
.45	31.266	3.613	5.665	5.266	4.866	4.660	4.573
.55	25.223	.971	4.498	4.691	4.717	4.822	4.980
.65	23.276	-1.378	4.171	4.781	5.053	5.491	5.903
.75	23.956	-3.213	4.740	5.595	6.086	6.823	7.751
.85	27.208	12.149	6.801	7.740	8.165	8.860	10.251
.95	46.779	41.055	32.684	34.423	33.286	30.232	26.461

	180	210	240	270	300	330	360
.15	-36.291	4.976	87.043	30.867	20.070	22.446	-13.833
.25	8.572	3.606	-1.194	-8.663	-47.485	8.376	44.336
.35	4.668	4.054	3.280	1.620	-4.298	-54.655	42.137
.45	4.573	4.558	4.419	3.607	1.021	-31.040	31.266
.55	4.980	5.263	5.314	-.433	2.955	-8.896	25.223
.65	5.903	6.342	6.379	5.689	4.146	-1.841	23.276
.75	7.751	8.359	8.235	7.269	5.481	1.538	23.956
.85	10.251	12.073	12.016	10.363	7.907	4.573	27.208
.95	26.461	23.661	23.398	23.162	21.624	21.215	46.779

TWO BLADES

	0	30	60	90	120	150	180
.15	-26.794	31.045	-1.932	-4.716	8.171	-29.035	-39.069
.25	33.156	51.694	32.306	35.015	-13.484	9.575	6.596
.35	32.484	47.639	20.631	24.495	-2.868	2.887	3.208
.45	22.197	25.603	16.718	31.438	.176	2.924	3.453
.55	16.533	20.224	15.758	1.522	1.637	3.532	4.098
.65	14.633	13.978	16.021	-4.771	2.851	4.485	5.191
.75	15.032	9.829	17.432	-3.376	4.435	6.030	7.166
.85	17.708	23.719	21.531	2.448	6.892	8.218	9.776
.95	36.233	51.520	48.868	30.968	32.280	29.693	26.048

	180	210	240	270	300	330	360
.15	-39.069	2.799	84.747	28.102	16.272	16.404	-26.794
.25	6.596	1.958	-2.975	-10.850	-50.500	3.656	33.156
.35	3.208	2.765	1.850	-.208	-6.807	-58.663	32.484
.45	3.453	3.527	3.230	2.059	-1.185	-34.596	22.197
.55	4.098	4.418	4.322	-.622	.943	-12.218	16.533
.65	5.191	5.654	5.535	4.502	2.271	-5.048	14.633
.75	7.166	7.775	7.521	6.210	3.699	-1.683	15.032
.85	9.776	11.577	11.398	9.428	6.195	1.240	17.708
.95	26.048	23.235	22.857	22.336	19.969	17.592	36.233

TABLE II-A, CONTINUED

MU = .4 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	35.051	-18.920	26.289	-9.545	-9.746	-8.516	-21.672
.25	19.682	9.692	58.457	25.075	27.616	35.053	-4.390
.35	8.313	-53.986	41.082	13.357	19.837	-14.264	-2.747
.45	3.886	42.648	39.594	12.449	27.779	-6.345	-.222
.55	.830	37.229	38.859	13.809	-7.546	-1.055	1.821
.65	-1.169	27.316	28.465	18.446	-16.962	1.641	3.524
.75	-3.025	20.588	23.481	21.851	-2.199	4.095	5.943
.85	-2.289	33.345	15.419	1.519	3.485	6.818	8.829
.95	6.682	61.149	27.676	21.775	30.152	28.651	25.312

	180	210	240	270	300	330	360
.15	-21.672	-4.779	79.698	23.209	9.829	3.509	35.051
.25	-4.390	-3.062	-6.868	-14.743	-55.108	-4.463	19.682
.35	-2.747	-.754	-1.216	-3.545	-10.928	-65.035	8.313
.45	-.222	.994	.804	-.877	-4.978	-40.279	3.886
.55	1.821	2.586	2.367	-.856	-2.974	-17.903	.830
.65	3.524	4.254	3.973	2.227	-1.808	-11.353	-1.169
.75	5.943	6.697	6.258	4.287	-.495	-9.945	-3.025
.85	8.829	10.728	10.371	7.752	1.853	-5.740	-2.289
.95	25.312	22.543	22.020	20.907	15.384	24.666	6.682

FOUR BLADES

	0	30	60	90	120	150	180
.15	-15.740	33.229	-38.990	31.740	22.093	-17.792	-25.914
.25	49.207	36.303	83.873	48.017	-2.752	21.348	28.275
.35	50.453	9.414	32.522	33.834	7.706	18.298	79.859
.45	-6.392	81.409	7.758	40.090	12.516	21.892	-25.847
.55	-20.651	53.514	20.393	10.762	18.552	-4.416	-4.920
.65	-30.136	39.307	17.321	6.196	19.990	-5.541	.413
.75	-28.271	32.153	20.640	11.836	-14.019	.329	3.995
.85	22.619	44.151	24.149	18.816	-3.450	4.605	7.456
.95	68.285	71.122	55.578	23.351	26.738	27.173	24.301

	180	210	240	270	300	330	360
.15	-25.914	19.313	69.401	14.795	.068	-21.551	-15.740
.25	28.275	-6.229	-14.902	-21.397	-62.178	-17.775	49.207
.35	79.859	-20.938	-9.762	-9.304	-17.627	-73.862	50.453
.45	-25.847	-5.381	-4.688	-6.802	-12.495	-48.341	-6.392
.55	-4.920	-.973	-1.183	-1.119	-9.829	-26.099	-20.651
.65	.413	1.933	1.406	-2.036	-8.200	-15.177	-30.136
.75	3.995	5.049	4.452	.848	-15.064	7.047	-28.271
.85	7.456	9.519	8.974	5.027	.493	11.934	22.619
.95	24.301	21.633	20.909	18.790	13.984	26.391	68.285

TABLE II-B

$\frac{4\pi R(V_i)_1}{\Gamma_1}$ VERSUS XP AND PSI

UNIFORM VORTEX SHEET

MU = .2 ONE BLADE

	PSI						
	0	30	60	90	120	150	180
XP							
.15	-2.966	1.393	8.238	10.739	-13.889	-13.102	-18.517
.25	8.370	8.009	13.861	-.064	-5.353	-4.060	-5.651
.35	3.772	9.199	14.625	-18.809	-2.206	-1.400	-2.017
.45	-8.783	3.594	14.068	-9.985	-2.386	-1.764	-1.975
.55	-6.059	4.236	17.263	-2.181	1.230	1.617	1.364
.65	-5.407	3.625	16.100	-2.031	.442	1.189	1.083
.75	-.587	6.863	26.867	2.919	5.258	5.739	5.842
.85	3.978	6.903	43.212	3.953	5.794	6.561	7.200
.95	33.518	33.606	40.725	31.974	32.385	31.035	29.092
	180	210	240	270	300	330	360
.15	-18.517	-29.120	-41.516	9.364	-3.715	-.239	-2.966
.25	-5.651	-9.408	-10.720	-10.888	-7.952	15.031	8.370
.35	-2.017	-3.295	-4.078	-3.947	-3.016	-4.153	3.772
.45	-1.975	-2.797	-3.572	-3.459	-3.133	-3.979	-8.783
.55	1.364	.986	.545	.418	.157	-1.115	-6.059
.65	1.083	.959	.846	.420	-.363	-2.082	-5.407
.75	5.842	5.576	5.278	4.644	3.392	1.563	-.587
.85	7.200	7.596	7.435	6.550	4.795	5.690	3.978
.95	29.092	27.357	26.237	25.548	24.528	32.496	33.518

TWO BLADES

	0	30	60	90	120	150	180
.15	-12.378	-11.912	-.331	17.638	-7.572	-7.175	-8.565
.25	7.562	-8.802	17.541	-1.434	-.999	5.647	8.837
.35	13.921	-4.930	14.776	-17.242	8.294	15.167	41.759
.45	-2.321	6.539	14.538	-4.313	12.366	12.157	-16.353
.55	-3.314	8.307	28.012	8.667	58.777	-7.791	-4.472
.65	-6.727	17.547	19.507	11.401	-13.758	-4.674	-2.349
.75	-7.636	19.486	28.546	26.242	-3.864	2.268	3.531
.85	4.497	16.450	51.848	29.450	.942	4.287	5.561
.95	37.371	47.421	54.024	3.823	29.352	29.449	27.873
	180	210	240	270	300	330	360
.15	-8.565	-13.744	-20.937	31.373	22.944	-.054	-12.378
.25	8.837	14.433	21.861	10.426	12.938	31.320	7.562
.35	41.759	-22.353	3.560	32.336	10.482	6.879	13.921
.45	-16.353	-12.011	-15.588	19.662	10.177	4.647	-2.321
.55	-4.472	-4.709	-8.696	11.040	11.629	2.025	-3.314
.65	-2.349	-2.409	-4.947	-36.181	11.260	.059	-6.727
.75	3.531	3.231	1.881	-6.038	15.853	1.274	-7.636
.85	5.561	5.918	5.026	-.165	18.927	2.673	4.497
.95	27.873	26.091	24.442	20.942	44.155	29.482	37.371

TABLE II-B, CONTINUED

MU = .2 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	1.618	-14.150	-11.376	11.531	-3.555	-.004	4.535
.25	7.816	14.615	10.694	7.392	4.796	15.555	-14.886
.35	-.865	11.374	15.210	-7.927	26.863	-6.167	1.769
.45	-12.235	15.767	16.065	5.883	4.120	4.587	6.609
.55	-10.796	29.113	18.113	19.134	2.139	26.348	65.988
.65	2.261	16.924	20.110	32.554	1.111	31.335	-20.226
.75	6.146	12.585	36.328	12.713	38.724	-17.658	-1.672
.85	-.430	23.128	61.089	19.432	-8.380	-1.252	2.576
.95	26.783	54.837	67.449	-78.858	24.543	26.642	26.030

	180	210	240	270	300	330	360
.15	4.535	-33.581	-55.631	8.820	-2.400	2.793	1.618
.25	-14.886	-3.817	-9.086	-9.832	-14.915	14.611	7.816
.35	1.769	4.947	1.764	-2.964	-7.321	-3.208	-.865
.45	6.609	14.219	8.962	.985	-3.865	3.172	-12.235
.55	65.988	19.360	47.652	6.859	7.250	5.442	-10.796
.65	-20.226	-27.449	1.443	10.733	13.938	.609	2.261
.75	-1.672	-3.757	-7.530	27.102	18.910	1.418	6.146
.85	2.576	2.639	.179	6.136	27.706	3.358	-.430
.95	26.030	24.088	21.486	3.445	38.709	36.048	26.783

FOUR BLADES

	0	30	60	90	120	150	180
.15	-20.700	7.484	-14.019	25.431	6.248	-.726	-31.414
.25	-1.299	.006	34.053	15.309	21.904	-3.435	4.260
.35	2.852	3.585	13.812	.846	6.534	13.434	35.348
.45	-21.111	15.261	-.433	13.733	17.776	17.277	-10.429
.55	-1.607	18.382	28.873	32.344	66.244	6.835	2.767
.65	5.020	23.112	22.511	-23.723	-3.892	21.498	127.920
.75	-6.117	30.119	33.748	26.013	14.423	-8.093	-44.388
.85	8.458	30.004	70.355	42.588	.186	-7.154	-3.959
.95	36.092	72.558	80.207	11.270	19.081	23.652	23.193

	180	210	240	270	300	330	360
.15	-31.414	-8.078	-23.298	28.149	20.812	-3.114	-20.700
.25	4.260	15.166	24.912	8.576	8.801	25.837	-1.299
.35	35.348	-19.313	4.833	31.187	8.734	-1.259	2.852
.45	-10.429	-2.531	-7.784	19.215	7.125	-3.337	-21.111
.55	2.767	9.736	3.953	23.091	9.673	-.449	-1.607
.65	127.920	62.659	28.751	-28.534	6.474	3.408	5.020
.75	-44.388	-17.179	52.116	5.373	5.307	4.651	-6.117
.85	-3.959	-1.619	-11.438	27.095	20.094	10.499	8.458
.95	23.193	21.470	17.377	-22.098	49.496	36.822	36.092

TABLE II-B, CONTINUED

MU = .2 ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	10.224	4.940	-8.720	-7.281	-7.641	-9.562	-18.193
.25	19.578	24.000	-3.440	-.732	-.920	-2.132	-4.959
.35	13.175	19.913	-2.575	.677	.480	-.254	-1.596
.45	7.830	18.086	-3.483	-.830	-.662	-.897	-1.496
.55	8.326	15.916	-.458	2.423	2.643	2.368	1.768
.65	5.189	12.969	-2.296	.909	1.475	1.760	1.795
.75	1.359	15.816	1.592	5.577	6.082	6.333	6.427
.85	-.793	.115	2.688	5.490	6.225	6.906	7.869
.95	23.878	40.768	32.347	35.381	34.640	32.188	29.070

	180	210	240	270	300	330	360
.15	-18.193	-141.317	10.271	4.113	3.866	5.315	10.224
.25	-4.959	-16.546	-13.981	4.767	-11.948	67.519	19.578
.35	-1.596	-4.145	-7.284	-6.828	-7.226	28.134	13.175
.45	-1.496	-3.099	-5.592	-4.347	-2.704	-8.177	7.830
.55	1.768	.962	.107	.441	1.578	-.544	8.326
.65	1.795	1.557	.930	.848	1.127	.023	5.189
.75	6.427	6.225	5.710	5.300	4.930	3.881	1.359
.85	7.869	8.764	8.593	7.546	6.377	5.042	-.793
.95	29.070	26.555	25.438	24.685	24.764	25.443	23.878

TWO BLADES

	0	30	60	90	120	150	180
.15	5.050	-7.447	-6.327	-2.181	2.904	11.487	-27.636
.25	14.763	8.325	2.814	7.145	15.782	-7.541	-9.969
.35	8.367	21.135	-1.480	12.025	33.015	-6.791	-4.814
.45	2.727	19.360	4.516	11.956	-16.780	-4.586	-3.628
.55	2.629	15.782	5.258	18.194	-4.188	-.066	.260
.65	-1.456	16.094	3.828	27.950	-2.914	.080	.677
.75	-5.983	16.860	10.234	2.581	3.227	5.112	5.570
.85	-4.889	-.769	12.757	-2.355	4.364	5.973	7.188
.95	27.189	42.456	47.790	30.690	33.253	31.455	28.518

	180	210	240	270	300	330	360
.15	-27.636	-146.252	6.626	1.087	.850	1.845	5.050
.25	-9.969	-19.842	-16.856	1.931	-14.969	64.172	14.763
.35	-4.814	-6.509	-9.591	-9.504	-10.369	24.578	8.367
.45	-3.628	-4.830	-7.429	-6.792	-6.091	-12.150	2.727
.55	.260	-.358	-1.408	-1.728	-2.262	-6.000	2.629
.65	.677	.528	-.310	-1.081	-3.256	-8.309	-1.456
.75	5.570	5.407	4.687	3.570	.312	-2.459	-5.983
.85	7.188	8.102	7.751	6.043	1.767	18.101	-4.889
.95	28.518	26.005	24.733	23.399	19.820	39.241	27.189

TABLE II-B, CONTINUED

MU = .3 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	-7.374	1.722	-10.019	12.362	-13.968	-7.898	-9.425
.25	4.729	14.161	4.345	25.360	-5.474	6.796	8.433
.35	-.938	7.637	6.233	49.418	3.362	14.387	37.568
.45	-7.239	28.547	15.053	4.922	6.545	17.571	-16.034
.55	-1.380	16.550	13.495	-.055	23.590	-6.258	-4.695
.65	8.855	14.566	12.496	7.523	9.606	-5.454	-2.155
.75	-2.405	18.642	23.207	21.011	-3.402	2.064	3.720
.85	.823	-4.007	31.052	107.821	.010	4.074	5.909
.95	28.830	41.086	81.058	11.802	30.707	30.149	27.591

	180	210	240	270	300	330	360
.15	-9.425	-120.399	26.250	-9.076	-8.168	-4.980	-7.374
.25	8.433	.799	-27.620	-4.501	-25.963	57.259	4.729
.35	37.568	-23.316	-18.488	-32.614	-14.839	16.571	-.938
.45	-16.034	-11.348	-14.103	-14.133	4.531	-1.459	-7.239
.55	-4.695	-4.524	-6.535	-9.960	31.195	12.531	-1.380
.65	-2.155	-2.036	-3.701	-10.243	19.774	7.606	8.855
.75	3.720	3.730	2.441	-2.685	23.863	7.430	-2.405
.85	5.909	6.897	6.215	2.217	32.187	5.241	.823
.95	27.591	25.109	23.560	20.706	47.924	24.013	28.830

FOUR BLADES

	0	30	60	90	120	150	180
.15	6.843	-8.773	-11.275	7.749	-.197	7.589	-19.772
.25	6.145	3.327	19.867	-.469	12.991	-1.188	9.019
.35	-19.921	5.403	15.490	8.143	34.973	2.432	14.056
.45	11.955	20.072	17.925	11.424	-11.103	8.574	50.747
.55	3.057	21.417	21.013	20.996	5.966	27.037	-119.712
.65	-7.032	15.053	25.582	34.791	5.787	-19.157	-13.728
.75	-5.593	13.439	33.279	14.340	89.623	-3.436	-.008
.85	-2.738	-3.304	47.610	33.124	-19.460	1.260	3.958
.95	22.496	51.567	64.712	-87.802	25.763	28.423	26.316

	180	210	240	270	300	330	360
.15	-19.772	-135.926	19.239	24.173	4.142	-17.146	6.843
.25	9.019	-5.616	-1.750	19.931	1.855	58.541	6.145
.35	14.056	14.356	22.047	7.731	3.597	44.637	-19.921
.45	50.747	25.756	21.489	19.941	5.892	-3.711	11.955
.55	-119.712	-10.765	-16.255	22.734	7.955	-1.597	3.057
.65	-13.728	-6.868	-10.436	25.424	6.200	-7.938	-7.032
.75	-.008	1.151	-2.087	-15.696	10.403	-3.880	-5.593
.85	3.958	5.161	3.510	-9.559	13.345	11.788	-2.738
.95	26.316	23.914	21.882	16.208	34.830	33.530	22.496

TABLE II-B, CONTINUED

MU = .4 ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	-8.274	-5.684	-5.597	-6.127	-6.802	-8.135	-13.093
.25	11.840	-.030	.782	.550	-.166	-1.532	-4.213
.35	26.014	.775	2.056	1.732	1.084	.016	-1.681
.45	19.182	-1.977	.089	-.077	-.364	-.682	-1.340
.55	16.421	-.234	2.989	3.247	3.094	2.609	1.792
.65	12.217	-3.072	1.125	1.462	1.653	1.966	2.086
.75	13.114	-.769	5.458	6.168	6.428	6.726	6.945
.85	11.421	12.263	5.220	5.838	6.225	6.964	8.385
.95	32.279	45.606	36.400	38.011	36.647	33.172	28.845

	180	210	240	270	300	330	360
.15	-13.093	-8.242	23.818	16.185	11.219	21.801	-8.274
.25	-4.213	-15.805	12.440	.186	-5.995	10.709	11.840
.35	-1.681	-5.023	-19.124	-2.309	-8.609	11.691	26.014
.45	-1.340	-3.456	-12.294	-8.056	-5.800	2.874	19.182
.55	1.792	.663	-1.284	-5.653	2.305	-2.720	16.421
.65	2.086	1.844	.323	.359	1.454	-1.815	12.217
.75	6.945	6.682	5.944	5.423	5.332	3.256	13.114
.85	8.385	10.051	9.598	8.115	6.708	4.869	11.421
.95	28.845	25.494	24.826	24.647	23.734	24.591	32.279

TWO BLADES

	0	30	60	90	120	150	180
.15	-13.458	-1.237	-1.262	6.415	22.739	-13.975	-15.198
.25	7.276	1.870	5.658	13.427	-27.675	-4.604	-5.702
.35	21.967	2.667	10.424	19.140	-6.579	-1.929	-2.776
.45	15.287	-1.271	6.897	28.177	-4.152	-2.032	-2.174
.55	12.618	7.062	9.347	2.399	.660	1.619	1.137
.65	8.375	-.147	14.938	-6.288	-.053	1.199	1.558
.75	9.133	1.359	17.062	-1.376	5.161	6.127	6.511
.85	7.088	14.956	18.959	1.550	5.258	6.482	8.040
.95	27.439	47.648	53.638	35.296	35.892	32.770	28.544

	180	210	240	270	300	330	360
.15	-15.198	-9.701	22.450	14.695	9.342	19.066	-13.458
.25	-5.702	-16.933	11.326	-1.066	-7.603	8.413	7.276
.35	-2.776	-5.921	-20.047	-3.419	-10.012	9.666	21.967
.45	-2.174	-4.179	-13.080	-9.028	-7.099	.975	15.287
.55	1.137	.066	-1.953	-5.402	1.071	-4.555	12.618
.65	1.558	1.360	-.249	-.425	.259	-3.668	8.375
.75	6.511	6.264	5.453	4.711	4.154	1.295	9.133
.85	8.040	9.699	9.171	7.470	5.544	2.750	7.088
.95	28.544	25.189	24.449	24.073	22.586	22.166	27.439

TABLE II-B, CONTINUED

MU = .4 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	-4.741	-5.656	10.392	-9.036	-1.402	4.951	4.248
.25	-.997	-2.483	17.471	-3.017	7.985	21.650	-14.786
.35	12.800	-16.294	21.335	1.762	14.229	-16.382	-7.558
.45	7.933	3.566	24.893	1.887	23.621	-9.813	-5.093
.55	5.976	3.958	35.880	11.758	-5.704	-2.048	-.601
.65	1.494	7.046	22.475	12.595	-17.821	-1.017	.296
.75	1.183	5.195	22.700	25.931	-.415	4.639	5.599
.85	-2.315	17.166	15.703	2.257	2.533	5.427	7.338
.95	14.927	56.487	33.210	27.522	34.241	31.992	28.003

	180	210	240	270	300	330	360
.15	4.248	-15.618	19.000	11.872	6.117	13.561	-4.741
.25	-14.786	-20.790	8.541	-3.563	-10.246	4.563	-.997
.35	-7.558	-8.602	-22.257	-5.675	-12.551	6.333	12.800
.45	-5.093	-6.097	-14.847	-11.101	-9.594	-2.246	7.933
.55	-.601	-1.308	-3.386	-4.998	-1.703	-8.087	5.976
.65	.296	.313	-1.393	-2.102	-2.769	-7.929	1.494
.75	5.599	5.472	4.526	3.292	.953	-4.804	1.183
.85	7.338	9.077	8.420	6.220	2.151	-1.969	-2.315
.95	28.003	24.685	23.843	23.007	18.881	31.119	14.927

FOUR BLADES

	0	30	60	90	120	150	180
.15	-14.818	5.178	-13.620	6.752	22.983	-9.237	-5.656
.25	7.394	2.562	9.439	12.621	-17.528	15.158	9.241
.35	17.601	-4.329	16.240	16.613	-2.248	15.774	76.382
.45	.910	10.834	-9.881	31.048	7.905	20.635	-28.416
.55	-3.424	12.669	-9.329	8.581	17.619	-3.340	-6.316
.65	-10.235	9.034	13.449	2.818	19.368	-6.994	-2.175
.75	-11.592	9.446	17.299	10.525	-10.553	1.587	4.096
.85	-1.283	24.417	25.360	21.061	-3.404	3.689	6.295
.95	45.898	59.374	60.912	30.148	31.464	30.864	27.250

	180	210	240	270	300	330	360
.15	-5.656	10.380	11.292	6.311	1.316	2.890	-14.818
.25	9.241	-20.947	2.443	-8.260	-14.443	-1.514	7.394
.35	76.382	-26.664	-29.326	-9.937	-17.226	1.501	17.601
.45	-28.416	-11.366	-19.291	-15.761	-15.327	-7.286	.910
.55	-6.316	-4.141	-6.190	-4.374	-6.918	-13.494	-3.424
.65	-2.175	-1.485	-3.393	-5.511	-7.491	-9.014	-10.235
.75	4.096	4.207	3.160	.546	-11.581	13.739	-11.592
.85	6.295	8.169	7.365	4.052	2.203	13.994	-1.283
.95	27.250	24.006	23.004	21.327	18.936	29.659	45.898

TABLE II-C

$\frac{4\pi R(V_i)_2}{\Gamma_2}$ VERSUS XP AND PSI

LINEAR VORTEX SHEET

MU = .2

ONE BLADE

	PSI						
	0	30	60	90	120	150	180
XP							
.15	-4.898	.134	8.829	15.437	-8.567	-6.521	-7.277
.25	-2.715	.060	8.920	-.978	-6.452	-4.802	-5.465
.35	-3.612	2.447	9.945	-19.150	-3.724	-2.916	-3.338
.45	-6.649	-2.241	9.546	-10.686	-3.879	-3.371	-3.589
.55	-3.617	-1.373	13.588	-3.312	-.453	-.226	-.565
.65	-4.457	-2.211	11.776	-3.763	-1.713	-1.090	-1.260
.75	1.053	2.428	25.452	2.376	4.336	4.639	4.582
.85	4.425	1.551	43.756	2.154	3.752	4.507	5.190
.95	36.902	32.284	43.940	34.238	34.390	32.850	30.708
	180	210	240	270	300	330	360
.15	-7.277	-10.035	-13.586	-3.061	-7.001	-3.660	-4.898
.25	-5.465	-7.566	-8.267	-8.157	-5.793	-2.646	-2.715
.35	-3.338	-4.256	-4.855	-4.606	-3.733	-3.715	-3.612
.45	-3.589	-4.383	-5.049	-4.745	-4.123	-4.256	-6.649
.55	-.565	-.989	-1.384	-1.253	-1.111	-1.731	-3.617
.65	-1.260	-1.435	-1.530	-1.725	-2.050	-3.100	-4.457
.75	4.582	4.193	3.891	3.459	2.686	1.594	1.053
.85	5.190	5.608	5.522	4.767	3.400	4.856	4.425
.95	30.708	28.796	27.589	26.982	26.341	34.641	36.902

TWO BLADES

	0	30	60	90	120	150	180
.15	-11.274	-6.606	-.531	17.237	-6.077	-4.175	-.352
.25	-.637	-7.758	7.534	-5.977	-6.274	1.509	5.256
.35	8.278	-4.313	6.402	-22.045	4.349	11.167	41.219
.45	.248	-3.308	6.449	-8.633	7.262	12.063	-16.364
.55	-.798	.556	20.948	5.812	66.268	-8.246	-5.516
.65	-5.305	7.378	11.829	8.002	-13.491	-6.098	-4.114
.75	-3.282	10.647	22.815	25.680	-3.532	1.739	2.692
.85	-.566	6.347	50.337	29.660	-.331	2.643	3.866
.95	33.122	40.490	55.308	8.367	31.888	31.572	29.734
	180	210	240	270	300	330	360
.15	-.352	3.321	5.949	20.719	22.546	-.973	-11.274
.25	5.256	18.048	25.568	14.272	15.145	14.919	-.637
.35	41.219	-21.198	4.382	33.516	8.096	6.208	8.278
.45	-16.364	-12.290	-15.382	19.939	7.683	3.029	.248
.55	-5.516	-5.825	-9.415	10.917	8.249	-1.524	-.798
.65	-4.114	-4.221	-6.488	-35.414	7.490	-3.781	-5.305
.75	2.692	2.272	1.077	-5.805	12.779	-1.348	-3.282
.85	3.866	4.252	3.554	-.963	15.396	-.764	-.566
.95	29.734	27.782	26.137	23.101	44.089	28.900	33.122

TABLE II-C, CONTINUED

MU = .2

THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	5.568	-13.770	-2.608	9.580	-4.042	2.038	13.079
.25	-.092	8.079	-2.723	-1.840	-1.765	12.111	-18.374
.35	-5.822	9.515	2.674	-13.793	22.795	-9.658	-2.296
.45	-7.494	.671	5.049	-.950	.797	.806	-.244
.55	-2.497	9.106	7.811	8.107	-1.246	23.209	65.050
.65	-4.581	.997	8.121	30.665	-10.423	31.124	-20.390
.75	-.510	-.721	28.867	11.972	39.761	-16.568	-1.747
.85	-2.665	7.714	56.920	20.947	-8.432	-2.176	1.374
.95	31.920	44.092	68.405	-70.200	27.816	29.217	28.236

	180	210	240	270	300	330	360
.15	13.079	-16.365	-31.832	-4.277	-5.010	.363	5.568
.25	-18.374	-1.862	-7.258	-7.568	-13.885	-3.015	-.092
.35	-2.296	2.382	-.658	-3.957	-9.531	-3.637	-5.822
.45	-.244	12.443	6.041	-1.120	-6.335	1.515	-7.494
.55	65.050	19.980	52.211	3.367	4.663	2.476	-2.497
.65	-20.390	-27.319	1.168	6.368	9.959	-3.111	-4.581
.75	-1.747	-3.878	-7.169	27.497	14.459	-2.046	-.510
.85	1.374	1.478	-.582	7.109	25.518	-3.080	-2.665
.95	28.236	26.136	23.664	7.084	39.694	31.828	31.920

FOUR BLADES

	0	30	60	90	120	150	180
.15	-11.433	10.709	-10.724	15.461	1.442	.847	-25.101
.25	-5.782	.028	3.846	2.605	13.540	-9.772	-2.890
.35	.514	-.680	-1.013	-11.138	.889	6.617	28.127
.45	-11.732	-3.719	-13.862	2.447	14.179	15.153	-14.874
.55	-6.324	-.270	15.700	26.467	73.979	7.265	-8.992
.65	-1.145	1.012	7.754	-42.774	-4.921	24.857	127.618
.75	-3.941	11.119	19.397	22.210	15.424	-6.169	-41.992
.85	3.613	9.675	65.067	42.588	.923	-7.272	-4.440
.95	31.186	60.179	77.264	18.306	23.187	26.708	25.814

	180	210	240	270	300	330	360
.15	-25.101	6.713	1.300	15.608	19.429	-2.974	-11.433
.25	-2.890	15.993	26.463	10.222	9.020	8.984	-5.782
.35	28.127	-21.109	2.459	29.612	4.605	-2.154	.514
.45	-14.874	-5.059	-9.633	16.199	2.777	-4.824	-11.732
.55	-8.992	5.509	1.700	23.830	4.144	-3.269	-6.324
.65	127.618	61.723	32.594	-30.103	.160	-2.039	-1.145
.75	-41.992	-16.052	52.362	2.244	-.507	-1.463	-3.941
.85	-4.440	-2.156	-11.075	28.196	16.099	2.190	3.613
.95	25.814	23.937	20.138	-16.440	48.269	30.557	31.186

TABLE II-C, CONTINUED

MU = .3

ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	9.156	8.733	-5.168	-3.534	-3.437	-4.082	-6.592
.25	6.188	20.319	-5.623	-2.830	-2.743	-3.312	-4.867
.35	3.972	15.184	-4.572	-1.451	-1.485	-2.019	-3.069
.45	.125	13.104	-4.982	-2.622	-2.472	-2.698	-3.293
.55	.945	11.141	-1.853	.597	.725	.362	-.370
.65	-1.619	8.134	-4.080	-1.380	-.904	-.669	-.713
.75	1.176	12.141	1.197	4.690	5.065	5.157	5.018
.85	.857	-4.572	.954	3.276	3.976	4.733	5.781
.95	28.401	39.753	34.874	37.573	36.690	34.020	30.620

	180	210	240	270	300	330	360
.15	-6.592	-35.879	-2.846	-3.910	-1.465	1.561	9.156
.25	-4.867	-11.797	-10.392	.879	-6.211	14.183	6.188
.35	-3.069	-5.105	-7.593	-7.010	-6.581	6.641	3.972
.45	-3.293	-4.897	-7.308	-5.837	-3.808	-5.680	.125
.55	-.370	-1.321	-2.220	-1.595	.089	-.696	.945
.65	-.713	-1.091	-1.874	-1.673	-.765	-1.083	-1.619
.75	5.018	4.555	3.933	3.786	3.944	3.527	1.176
.85	5.781	6.685	6.455	5.547	4.759	3.865	.857
.95	30.620	27.821	26.518	25.815	26.180	27.382	28.401

TWO BLADES

	0	30	60	90	120	150	180
.15	6.398	3.259	-7.435	-2.814	3.320	18.344	-14.679
.25	3.499	13.992	-4.384	1.350	12.588	-7.179	-9.061
.35	1.168	12.380	-7.425	7.796	32.086	-7.573	-5.733
.45	-2.964	9.439	-.920	7.702	-16.760	-5.770	-5.034
.55	-2.627	7.821	.224	9.217	-5.114	-1.645	-1.588
.65	-5.904	6.888	-1.559	28.134	-4.615	-2.038	-1.609
.75	-3.387	9.659	6.958	3.189	2.687	4.173	4.337
.85	-.072	-9.288	7.049	-3.435	2.461	3.987	5.241
.95	35.015	38.032	48.930	33.640	35.569	33.437	30.184

	180	210	240	270	300	330	360
.15	-14.679	-39.942	-5.720	-6.140	-3.534	-.578	6.398
.25	-9.061	-14.478	-12.663	-1.277	-8.403	11.979	3.499
.35	-5.733	-7.011	-9.416	-9.091	-8.952	4.152	1.168
.45	-5.034	-6.281	-8.753	-7.760	-6.438	-8.571	-2.964
.55	-1.588	-2.374	-3.417	-3.307	-2.986	-4.949	-2.627
.65	-1.609	-1.906	-2.853	-3.199	-4.362	-7.920	-5.904
.75	4.337	3.911	3.130	2.408	.119	-1.080	-3.387
.85	5.241	6.165	5.796	4.349	.924	17.816	-.072
.95	30.184	27.389	25.968	24.793	22.012	40.465	35.015

TABLE II-C, CONTINUED

MU = .3 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	.335	3.963	-5.674	8.352	-12.534	-5.923	-.389
.25	-1.838	12.062	-6.743	18.596	-10.301	3.498	5.391
.35	-4.392	7.167	-5.057	46.118	-1.573	11.117	37.161
.45	-9.325	8.473	4.942	.903	.404	17.509	-16.062
.55	-2.875	4.785	6.406	-3.712	20.922	-6.611	-5.801
.65	7.908	2.212	4.131	3.596	9.412	-6.795	-3.982
.75	4.406	7.489	17.423	14.655	-2.836	1.614	2.813
.85	.337	-15.302	26.726	107.709	-1.233	2.422	4.204
.95	26.624	33.414	85.997	16.575	33.458	32.375	29.441

	180	210	240	270	300	330	360
.15	-.389	-15.199	16.058	-14.509	-10.709	-4.936	.335
.25	5.391	7.497	-21.537	-6.092	-17.590	7.016	-1.838
.35	37.161	-22.103	-16.978	-30.053	-11.809	-1.874	-4.392
.45	-16.062	-11.845	-14.433	-13.782	5.519	3.716	-9.325
.55	-5.801	-5.914	-7.809	-10.331	31.957	12.883	-2.875
.65	-3.982	-4.055	-5.716	-11.269	18.990	5.425	7.908
.75	2.813	2.538	1.267	-3.044	23.594	5.502	4.406
.85	4.204	5.189	4.548	1.099	31.431	1.651	.337
.95	29.441	26.673	25.021	22.535	50.634	23.528	26.624

FOUR BLADES

	0	30	60	90	120	150	180
.15	2.749	.378	-4.830	3.148	-3.753	10.683	-9.891
.25	-7.148	9.680	2.138	-8.913	6.242	-4.191	11.323
.35	-17.588	3.064	2.405	.519	30.225	-.694	13.539
.45	14.606	2.501	6.685	4.317	-14.347	5.443	61.285
.55	4.147	3.860	10.576	9.253	1.669	26.363	-115.240
.65	-5.570	-1.251	12.861	33.371	-12.713	-18.996	-14.488
.75	-7.945	-.534	26.743	13.230	90.232	-3.128	-.400
.85	-4.744	-19.094	40.905	34.214	-19.177	.061	2.574
.95	23.436	39.616	66.725	-77.996	29.128	30.953	28.398

	180	210	240	270	300	330	360
.15	-9.891	-30.952	6.145	19.056	3.504	-12.421	2.749
.25	11.323	-1.188	1.476	16.919	10.505	11.265	-7.148
.35	13.539	9.377	25.938	8.071	3.177	26.937	-17.588
.45	61.285	25.536	21.429	20.543	4.415	-.410	14.606
.55	-115.240	-11.098	-16.168	22.355	5.475	-1.519	4.147
.65	-14.488	-8.211	-11.553	24.556	2.791	-9.650	-5.570
.75	-.400	.378	-2.678	-14.312	7.831	-4.622	-7.945
.85	2.574	3.755	2.243	-9.584	10.029	9.356	-4.744
.95	28.398	25.699	23.624	18.617	34.661	32.204	23.436

TABLE II-C, CONTINUED

MU = .4 ONE BLADE

PSI

XP	0	30	60	90	120	150	180
.15	-6.091	-3.150	-2.451	-2.528	-2.896	-3.608	-5.611
.25	5.686	-3.091	-1.910	-1.942	-2.280	-2.985	-4.492
.35	19.818	-2.376	-.626	-.627	-1.024	-1.849	-3.257
.45	12.634	-4.066	-2.013	-2.044	-2.254	-2.561	-3.256
.55	9.803	-1.818	1.022	1.278	1.125	.525	-.486
.65	4.878	-4.597	-1.236	-1.002	-.817	-.532	-.515
.75	6.834	-.371	4.596	5.225	5.413	5.540	5.436
.85	4.354	11.009	2.975	3.414	3.844	4.728	6.285
.95	29.962	48.124	38.716	40.294	38.809	35.064	30.365

	180	210	240	270	300	330	360
.15	-5.611	-6.836	3.851	8.036	6.324	20.646	-6.091
.25	-4.492	-11.580	3.624	-2.061	.109	9.316	5.686
.35	-3.257	-6.014	-17.628	-4.457	-6.708	12.044	19.818
.45	-3.256	-5.415	-14.310	-9.865	-7.076	2.956	12.634
.55	-.486	-1.911	-4.177	-7.962	.643	-2.392	9.803
.65	-.515	-.997	-3.076	-2.658	-.504	-2.259	4.878
.75	5.436	4.738	3.748	3.536	4.339	3.160	6.834
.85	6.285	7.927	7.224	5.861	5.102	3.905	4.354
.95	30.365	26.625	25.656	25.506	24.996	26.492	29.962

TWO BLADES

	0	30	60	90	120	150	180
.15	-8.661	-5.511	-2.946	7.507	27.369	-8.676	-7.315
.25	3.365	-5.853	-1.410	7.411	-27.539	-5.576	-5.689
.35	17.706	-5.611	3.655	15.762	-7.709	-3.461	-4.133
.45	10.550	-6.785	1.111	27.078	-5.445	-3.665	-3.920
.55	7.731	-.556	3.522	1.886	-.892	-.276	-1.007
.65	2.749	-5.740	11.307	-7.563	-2.214	-1.150	-.934
.75	4.611	-2.016	14.120	-1.366	4.383	5.061	5.092
.85	1.894	9.836	14.671	-.231	3.066	4.343	6.015
.95	27.185	46.684	55.927	38.039	38.206	34.745	30.129

	180	210	240	270	300	330	360
.15	-7.315	-7.936	2.893	7.071	5.190	19.117	-8.661
.25	-5.689	-12.438	2.823	-2.907	-.921	7.949	3.365
.35	-4.133	-6.702	-18.303	-5.238	-7.636	10.803	17.706
.45	-3.920	-5.971	-14.893	-10.564	-7.969	1.740	10.550
.55	-1.007	-2.373	-4.679	-7.515	-.229	-3.598	7.731
.65	-.934	-1.368	-3.509	-3.242	-1.372	-3.517	2.749
.75	5.092	4.413	3.376	3.002	3.464	1.776	4.611
.85	6.015	7.656	6.899	5.370	4.221	2.368	1.894
.95	30.129	26.389	25.367	25.068	24.115	24.670	27.185

TABLE II-C, CONTINUED

MU = .4 THREE BLADES

PSI

XP	0	30	60	90	120	150	180
.15	-10.203	-4.151	6.665	-9.310	-1.452	7.562	13.115
.25	-1.473	-5.461	9.527	-8.900	2.953	20.405	-13.510
.35	13.384	-9.086	12.099	-4.450	10.359	-16.047	-8.165
.45	6.862	-6.514	17.516	-4.212	21.615	-10.452	-6.372
.55	4.202	-5.263	31.470	7.904	-5.347	-3.359	-2.419
.65	-1.029	-4.390	16.828	6.733	-18.483	-2.982	-1.954
.75	.158	-1.825	19.776	26.926	-.491	3.843	4.363
.85	-3.624	8.598	12.626	1.456	.766	3.493	5.457
.95	20.451	51.868	35.527	31.222	36.847	34.122	29.701

	180	210	240	270	300	330	360
.15	13.115	-12.874	.229	5.119	3.212	16.219	-10.203
.25	-13.510	-15.607	.627	-4.745	-2.706	5.717	-1.473
.35	-8.165	-8.891	-20.047	-6.952	-9.452	8.689	13.384
.45	-6.372	-7.529	-16.294	-12.178	-9.824	-.434	6.862
.55	-2.419	-3.479	-5.817	-6.794	-2.397	-6.141	4.202
.65	-1.954	-2.208	-4.415	-4.579	-3.812	-6.760	-1.029
.75	4.363	3.785	2.641	1.871	.849	-3.151	.158
.85	5.457	7.165	6.307	4.368	1.407	-1.069	-3.624
.95	29.701	25.992	24.891	24.213	20.979	34.502	20.451

FOUR BLADES

	0	30	60	90	120	150	180
.15	-14.096	-.073	-7.235	2.342	22.909	-8.582	-1.884
.25	-.855	-2.848	-5.468	2.804	-21.405	15.228	2.463
.35	11.255	-6.521	3.661	9.513	-7.873	13.883	75.854
.45	2.297	-5.245	-17.557	25.557	4.457	20.972	-27.956
.55	-.817	-2.480	-17.878	4.958	14.874	-3.290	-7.456
.65	-7.229	-4.416	7.220	-1.148	18.255	-8.148	-4.027
.75	-7.699	-1.507	11.643	6.482	-9.458	1.248	3.130
.85	-5.860	11.958	21.019	20.983	-4.498	2.047	4.610
.95	41.553	51.278	62.188	34.430	34.472	33.202	29.100

	180	210	240	270	300	330	360
.15	-1.884	13.653	-6.080	.853	.299	10.890	-14.096
.25	2.463	-13.830	-4.354	-8.451	-5.668	2.294	-.855
.35	75.854	-25.432	-26.191	-10.386	-13.107	5.511	11.255
.45	-27.956	-12.082	-20.087	-16.087	-14.565	-4.092	2.297
.55	-7.456	-5.867	-8.167	-5.686	-6.641	-10.171	-.817
.65	-4.027	-3.691	-6.071	-7.453	-7.487	-6.470	-7.229
.75	3.130	2.751	1.537	-.435	-10.252	15.739	-7.699
.85	4.610	6.433	5.454	2.548	2.350	12.644	-5.860
.95	29.100	25.448	24.214	22.808	21.970	30.244	41.553

TABLE III-A

HARMONIC COEFFICIENTS D_{0K} OF EQUATION (54) FOR THE VELOCITY $\frac{4\pi R(V_i)_0}{\Gamma_0}$ OF TABLE II-A

HARMONIC COEFFICIENTS - ROOT AND TIP VORTICES

MU = .2 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-21.678	23.092	5.744	2.472	2.853	4.028	5.948	10.120	27.603
2	48.139	28.269	7.732	-.652	-1.560	-.867	-.504	1.352	1.787
3	2.919	4.358	3.371	3.209	3.339	3.338	3.901	5.165	4.557
4	-20.872	19.049	8.720	-1.472	-2.972	-2.422	-2.524	-2.793	.725
5	-32.923	-6.117	7.680	6.021	5.422	5.284	5.814	7.078	1.983
6	-24.682	5.958	3.134	-5.473	-5.938	-5.009	-5.310	-6.543	-.802
7	23.023	-14.299	8.008	4.804	3.627	3.314	3.032	2.180	1.025
8	26.065	-3.662	1.016	-6.252	-6.048	-4.867	-4.606	-4.932	-1.795
9	10.372	-16.617	.826	-.107	-.237	-.425	-1.180	-3.503	-.512
10	6.795	-10.042	6.541	-2.444	-3.134	-2.079	-1.185	.267	-1.604
11	-21.778	-10.306	-3.623	-2.598	-1.866	-1.724	-2.438	-4.424	-.935
12	-12.776	-6.352	5.451	.085	-.675	-.243	.401	1.528	-.652

MU = .2 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-14.195	32.324	14.026	9.001	9.581	2.013	7.028	16.676	31.365
2	35.290	13.756	-1.205	9.629	6.111	8.422	4.837	14.134	15.331
3	-1.716	-5.984	-.435	9.315	12.756	11.545	9.207	10.179	.268
4	-34.218	9.593	3.435	-7.741	-10.574	2.008	-6.730	.049	11.712
5	-33.806	-11.166	-6.170	1.027	.765	9.363	8.578	8.992	3.385
6	-32.743	2.348	-4.538	-5.634	-2.836	-13.051	-14.300	-6.784	-1.725
7	18.241	-24.117	10.821	14.318	6.451	-2.883	-.150	-.411	7.694
8	24.807	-3.431	14.611	-9.179	-10.518	-12.560	-9.071	-.957	-6.868
9	4.521	-26.659	-10.286	5.343	12.623	2.092	1.387	-.732	2.514
10	13.061	-4.822	4.298	-3.468	-11.343	-5.028	-5.933	4.034	3.289
11	-25.259	-14.219	-8.723	-4.466	-7.168	11.016	6.514	3.134	-2.719
12	-7.981	-1.475	11.728	-4.867	.012	-1.039	-3.408	2.294	5.550

TABLE III-A, CONTINUED

MU = .2 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-19.045	31.784	11.604	16.301	21.724	16.238	14.931	13.959	18.398
2	31.844	26.257	1.422	3.142	-15.188	20.791	20.281	17.262	11.551
3	10.569	23.277	14.106	13.410	6.697	15.149	8.070	7.608	-8.004
4	-18.993	10.949	-.692	-.114	-.296	-5.212	-6.662	-2.900	21.564
5	-47.361	-1.768	9.566	20.503	15.490	-1.901	3.466	11.488	7.784
6	-18.898	2.189	2.827	-10.014	-18.472	3.320	-1.702	-16.203	-12.975
7	23.537	-10.528	2.543	11.877	7.945	13.840	5.647	2.712	20.151
8	34.818	-11.473	-2.896	-14.808	-8.145	-.553	-.567	-8.095	-35.249
9	19.255	-19.761	2.636	8.087	-2.822	-3.030	11.201	-.936	.580
10	-3.426	-9.634	2.184	-16.644	-22.702	4.297	-3.614	-1.225	-8.390
11	-9.299	-13.439	-8.846	3.848	9.725	6.860	-9.677	.868	-16.035
12	-20.316	-7.939	7.489	-8.101	-3.947	-2.088	4.092	-.230	7.921

MU = .2 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-12.205	43.622	19.133	14.236	25.946	30.843	11.098	18.749	29.721
2	22.596	14.939	-2.787	6.280	12.999	-13.677	21.686	26.762	27.179
3	13.069	19.147	8.875	15.798	19.149	7.983	8.135	14.173	12.755
4	-48.594	-10.772	-3.449	-12.599	-1.456	34.283	-22.622	-7.768	17.843
5	-41.578	3.559	4.431	14.096	10.123	23.164	17.575	12.631	9.811
6	-26.051	-13.986	-11.902	-15.091	2.345	-24.045	4.614	-13.734	-11.676
7	18.447	-27.282	13.612	20.223	7.903	-5.123	6.245	3.483	1.579
8	21.439	-14.065	10.583	-15.210	-2.506	2.129	-20.375	-.001	-20.608
9	14.969	-35.072	-7.114	11.767	15.455	7.321	-5.383	1.440	1.023
10	3.725	-3.396	-2.716	-17.039	-9.325	-16.133	-11.975	-1.825	-1.208
11	-13.880	-28.210	-4.256	6.613	-1.595	8.238	7.994	-3.047	4.143
12	-18.519	5.500	6.994	-16.104	-.893	5.423	-2.697	-4.482	6.282

TABLE III-A, CONTINUED

MU = .3 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-48.229	35.265	14.492	5.284	6.231	7.238	6.324	6.249	26.362
2	93.910	51.964	18.861	2.897	3.939	4.553	-.062	-5.271	-1.375
3	14.701	-4.941	-2.272	3.643	1.560	.634	.111	-1.509	5.463
4	-66.621	41.723	14.274	4.251	4.853	5.705	1.466	-2.781	-1.625
5	-71.915	-29.684	-7.479	5.626	3.092	2.220	1.920	.004	1.739
6	21.999	17.684	6.007	4.514	4.433	5.240	.982	-1.919	-1.540
7	98.558	-42.747	-9.727	6.430	3.852	3.028	2.664	-.059	2.398
8	39.059	-13.320	-3.679	3.799	3.152	3.842	-.420	-2.079	-2.800
9	-91.389	-42.096	-8.725	5.727	3.663	3.034	2.869	.382	2.276
10	-82.161	-38.904	-11.392	2.921	1.877	2.484	-1.884	-2.379	-3.916
11	55.887	-26.040	-5.075	3.387	2.234	1.922	1.866	.358	1.500
12	49.328	-24.399	-7.174	1.272	.667	.956	-1.250	-1.279	-2.154

MU = .3 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-50.372	30.753	17.706	5.484	7.004	7.621	4.391	5.784	27.346
2	86.428	44.884	20.955	8.811	6.250	4.872	-.639	-3.400	2.072
3	23.154	-.415	9.978	9.625	9.493	8.833	3.510	-.526	7.414
4	-75.831	30.430	8.606	3.214	.442	.300	.139	-2.086	-.493
5	-78.903	-35.517	-4.307	16.289	10.545	9.064	7.892	2.461	4.408
6	21.339	17.638	8.329	-1.266	.330	1.441	-2.942	-5.677	-4.642
7	95.456	-52.768	-7.458	9.749	4.081	3.139	6.695	.529	2.316
8	36.979	-11.326	-8.488	3.006	4.057	4.966	-4.344	-7.884	-7.655
9	-99.390	-47.196	-.612	7.287	4.890	4.210	3.288	-3.040	-1.601
10	-74.351	-34.031	-18.937	-1.089	-1.001	.343	-4.076	-6.301	-7.430
11	52.471	-32.854	-7.186	9.611	7.550	6.612	.984	-3.810	-2.605
12	50.908	-19.145	-7.151	-3.750	-3.258	-2.258	-1.918	-2.434	-3.334

TABLE III-A, CONTINUED

MU = .3 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-50.425	35.780	12.304	10.579	9.296	9.678	7.797	19.244	30.945
2	75.117	39.505	3.948	14.350	12.912	12.852	4.999	6.466	11.755
3	24.265	15.510	21.093	22.175	8.857	7.750	6.506	16.546	5.159
4	-73.549	33.150	7.639	2.447	-1.144	1.937	-6.936	-17.985	4.004
5	-64.276	-21.433	-11.633	13.621	2.599	5.046	6.921	2.809	6.706
6	19.363	1.663	-9.048	-1.955	-4.355	-3.022	-13.290	-8.875	-8.617
7	90.387	-51.142	-17.922	21.091	5.200	2.063	-.108	-16.104	7.816
8	37.590	-12.704	3.936	-14.609	-11.878	-5.113	-7.726	11.491	-9.929
9	-89.520	-47.808	-18.427	14.281	12.372	6.840	3.027	.683	.730
10	-87.528	-35.786	-14.949	-8.535	-6.989	-2.198	-6.086	3.020	3.137
11	65.603	-29.612	1.145	9.803	2.228	3.960	7.818	18.582	-3.844
12	43.408	-26.564	-2.817	-7.459	1.854	1.525	-3.974	-5.064	5.874

MU = .3 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-47.215	41.818	22.819	22.842	2.380	10.295	15.101	9.872	19.765
2	73.352	42.738	.979	.754	29.211	12.718	7.528	10.879	13.160
3	25.878	4.138	2.054	7.673	18.230	14.855	25.402	7.977	-12.959
4	-82.227	22.940	-7.149	3.855	-28.480	-17.788	-3.132	-2.213	25.102
5	-78.873	-26.043	-4.967	28.001	6.091	10.393	-.527	9.973	6.574
6	33.948	9.982	-5.368	-10.321	10.639	-4.539	9.807	-14.461	-7.378
7	96.651	-50.796	-16.896	16.576	16.929	6.527	2.372	-6.625	24.614
8	55.633	-10.956	-19.110	-2.147	-22.703	-1.026	-11.557	-4.242	-30.131
9	-89.126	-54.327	-11.706	9.763	4.821	11.567	17.236	-7.463	1.457
10	-70.130	-21.378	-19.992	-10.162	17.420	-6.875	-5.714	1.186	-5.213
11	65.277	-41.181	-15.309	8.247	2.957	-4.591	-7.728	5.182	-18.951
12	47.604	-9.931	-5.762	-5.209	-18.743	-2.846	10.224	-1.209	8.791

TABLE III-A, CONTINUED

MU = .4 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	1.994	8.022	2.929	3.539	4.508	5.667	6.885	10.675	29.831
2	2.085	3.924	-1.887	-1.057	.559	.463	-.073	1.762	4.397
3	-34.282	18.687	8.827	3.907	1.776	-.371	-1.220	-.789	7.101
4	-17.006	11.838	2.229	1.646	3.047	2.190	2.220	3.456	3.040
5	8.732	7.288	10.713	5.592	1.796	.384	-.260	1.953	2.084
6	14.398	13.233	7.037	4.882	3.803	3.414	3.384	3.738	3.782
7	-2.346	-1.121	10.120	5.516	.717	.086	-.768	1.164	2.525
8	-11.483	7.824	11.004	7.638	4.106	4.244	4.257	3.215	2.874
9	-11.479	-6.840	7.711	4.381	1.178	-.005	-.667	1.161	1.746
10	-5.254	.723	13.584	9.521	5.758	4.808	4.792	2.977	1.979
11	7.152	-5.908	4.138	2.437	1.502	.004	-.385	.641	1.054
12	1.433	-1.230	7.239	5.095	3.439	2.487	2.489	1.382	.873

MU = .4 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	7.166	8.012	5.617	6.295	5.012	5.441	6.672	10.844	30.133
2	6.133	10.606	3.709	1.905	2.975	2.224	1.258	2.853	5.175
3	-20.582	22.717	16.265	12.006	4.737	1.539	.753	1.993	10.335
4	-22.045	11.079	.386	-3.097	2.729	2.714	2.299	2.496	1.335
5	15.133	19.303	19.967	11.800	7.336	5.286	4.341	6.593	6.776
6	15.142	4.715	2.405	1.102	.282	-.077	-.218	-.250	-.585
7	2.604	1.631	13.620	5.036	4.902	4.521	3.225	4.350	5.292
8	-17.785	7.967	9.377	8.491	.370	-.553	-.414	-1.004	-1.237
9	-1.717	-7.634	10.684	5.751	2.284	.542	-.514	.865	1.153
10	-15.137	-2.042	8.523	6.363	2.959	2.573	2.892	1.362	.503
11	6.777	1.846	9.706	7.719	1.236	-1.654	-2.320	-1.133	-.727
12	-.267	-7.162	2.465	1.136	2.202	2.308	2.541	1.405	.909

TABLE III-A, CONTINUED

MU = .4 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	8.700	7.245	-5.823	6.287	5.597	4.879	6.461	7.674	25.576
2	6.328	-1.300	-12.207	2.301	5.825	3.974	.061	-.116	1.132
3	-18.173	32.361	13.157	18.846	11.342	7.055	7.494	2.856	6.641
4	-11.278	1.920	-15.942	-6.833	-2.537	-2.370	-4.337	.713	1.700
5	12.588	7.956	8.013	15.568	15.952	13.349	9.463	9.157	4.984
6	15.092	6.911	-.078	-.320	-7.009	-7.389	-4.649	-2.422	-1.586
7	1.098	2.075	-3.227	10.377	6.137	3.306	1.727	6.901	6.953
8	-1.939	-.839	9.668	-2.478	-1.696	.877	.802	-3.721	-6.907
9	-17.983	-14.872	-.923	10.488	1.014	-1.432	.101	3.253	3.783
10	6.939	6.424	17.816	.073	.688	1.068	.104	-3.020	-8.861
11	2.894	-10.376	-7.933	-1.806	2.127	4.360	3.014	.928	.745
12	11.207	-.680	14.880	4.856	-.037	-2.209	-1.467	-1.396	-4.372

MU = .4 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	5.887	11.815	8.382	4.476	2.835	2.123	2.416	12.857	33.187
2	-7.706	7.259	-12.409	4.585	1.545	-2.110	.766	10.176	16.187
3	-8.168	41.208	27.158	26.307	15.538	11.655	6.017	6.194	11.794
4	-17.975	10.944	10.969	-7.047	-6.361	-6.480	-2.112	4.375	10.833
5	14.453	23.152	11.073	15.231	13.501	9.944	12.124	10.567	10.819
6	23.431	-3.069	-7.726	5.336	-1.487	-3.045	-7.901	-.659	3.678
7	.121	2.040	13.229	18.355	10.714	6.463	1.566	2.252	7.618
8	-4.667	14.209	30.327	-4.214	-6.817	-8.513	-5.314	.621	.493
9	12.071	-15.501	1.639	14.351	10.474	7.941	-3.514	.151	.494
10	-10.638	6.275	5.432	-.194	-7.923	-10.118	-8.997	-1.936	2.126
11	16.763	-4.460	7.639	15.494	1.116	-1.076	1.042	2.952	-1.895
12	-4.068	1.771	15.475	-9.334	-2.442	-1.990	-7.127	-2.817	1.777

TABLE III-B

HARMONIC COEFFICIENTS D_{1K} OF EQUATION (54) FOR THE VELOCITY $\frac{4\pi R(V_i)_1}{\Gamma_1}$ OF TABLE II-B

HARMONIC COEFFICIENTS - UNIFORM VORTEX SHEET

MU = .2 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-7.777	-.735	-1.277	-2.014	1.538	1.231	6.112	9.138	30.708
2	13.846	9.438	3.861	.875	.141	.035	.155	2.135	2.403
3	7.412	5.587	1.610	2.283	2.633	2.404	3.553	4.890	4.695
4	-6.113	3.903	3.670	-.379	-1.611	-1.563	-2.139	-2.761	.899
5	-4.338	.568	3.929	3.255	3.051	3.225	4.132	6.106	1.079
6	-7.396	-1.326	-2.017	-3.950	-3.844	-3.489	-4.358	-6.333	-.367
7	2.712	-2.083	5.018	2.522	1.430	1.398	1.198	.462	-.273
8	7.432	-1.322	-3.973	-4.036	-3.152	-2.715	-2.908	-3.718	-.675
9	.185	-4.159	-.622	-1.367	-1.688	-1.644	-2.649	-5.457	-1.821
10	1.325	-1.100	1.049	-.329	-.008	.209	.989	2.586	.177
11	-4.012	-2.258	-4.022	-3.024	-2.502	-2.231	-3.217	-5.726	-1.755
12	-4.283	-.505	2.457	1.050	.878	.885	1.562	2.930	.372

MU = .2 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-.892	9.944	8.554	2.458	8.289	-.939	7.064	12.117	31.202
2	4.916	.940	-2.204	6.260	2.618	6.956	4.206	6.510	8.365
3	-4.160	-8.687	-4.817	2.840	11.974	9.117	7.820	10.110	1.054
4	-13.908	.505	3.235	-6.517	-12.239	2.489	-5.397	-7.155	5.119
5	-7.948	-.559	-7.183	-6.620	-6.022	5.313	5.428	7.565	2.820
6	-9.155	-1.815	-6.873	-2.317	1.933	-8.975	-9.591	-10.978	-5.814
7	1.407	-6.174	12.548	8.339	.928	-5.393	-2.505	-2.911	6.402
8	7.909	-3.596	9.139	-3.289	-5.309	-7.524	-3.039	-2.282	-8.699
9	2.628	-8.486	-7.056	.190	8.725	.388	.106	-3.117	1.388
10	2.332	.237	-4.841	3.073	-3.972	-.170	-.198	3.936	2.198
11	-1.299	-3.417	-7.423	-6.488	-12.232	9.280	5.814	1.785	-3.211
12	-3.580	1.345	6.911	-1.988	5.366	1.436	-.679	2.349	5.000

TABLE III-B, CONTINUED

MU = .2 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-7.616	1.911	2.789	5.355	19.716	6.945	10.275	11.348	22.600
2	6.506	6.313	-.812	-3.194	-16.442	8.342	8.418	11.204	10.932
3	8.058	10.185	6.336	3.241	-.400	10.738	6.564	7.122	-7.349
4	-.031	3.351	-.498	-1.043	5.292	-11.473	-13.710	-8.297	20.490
5	-16.104	-1.102	3.338	6.783	10.545	-5.191	-.543	9.469	6.050
6	-8.054	3.772	3.017	-2.993	-8.726	-1.501	-2.704	-16.667	-9.896
7	2.320	.358	1.405	-.322	3.064	8.879	1.942	.430	17.274
8	14.242	-4.289	-5.286	-5.045	.579	-.614	.796	-4.419	-28.250
9	1.520	-4.488	4.079	-.367	-5.729	-7.068	7.780	-2.638	-1.363
10	.089	1.265	-3.521	-3.233	-13.223	4.402	-1.805	3.959	-.659
11	-4.382	-1.214	-7.413	-1.114	9.602	9.052	-11.816	-.043	-16.528
12	-3.518	-4.508	3.447	-2.079	2.007	-3.839	4.875	2.441	11.566

MU = .2 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-1.102	12.840	8.382	3.730	16.653	20.433	7.997	15.425	30.760
2	5.674	.780	-3.300	-2.462	-3.169	-28.458	12.754	17.656	19.195
3	.280	.630	-.945	4.885	14.631	-3.383	4.984	12.678	13.399
4	-17.130	-7.828	-2.094	-9.915	-15.232	35.602	-21.656	-14.819	10.713
5	-8.823	3.035	-3.540	-4.954	-3.082	15.811	11.910	9.191	9.029
6	-2.188	-.266	-7.279	-1.230	4.546	-21.171	10.959	-14.880	-13.391
7	3.444	-8.527	11.322	7.314	1.112	-4.378	2.319	-.253	.758
8	1.468	-6.129	9.175	-3.378	-2.504	-.262	-12.777	3.119	-18.645
9	9.760	-5.122	-4.514	4.605	9.356	1.758	-7.181	-1.962	.656
10	1.871	-3.293	-5.668	-1.648	-3.563	-11.820	-4.578	3.432	.645
11	1.805	-5.791	-2.902	-.311	-8.892	1.410	7.654	-5.186	4.042
12	-9.293	2.597	3.636	-6.206	1.663	10.697	1.183	-1.476	6.814

TABLE III-B, CONTINUED

MU = .3 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-12.832	5.100	2.705	-.447	2.960	2.190	5.769	5.401	29.596
2	27.370	19.954	9.782	3.566	2.695	1.664	-.253	-3.440	-.034
3	4.647	-.228	2.681	3.557	1.891	.690	.621	-1.782	5.951
4	-12.333	10.358	7.976	3.448	2.441	2.127	.646	-1.248	-.539
5	-18.302	-9.019	-2.197	2.648	1.512	1.266	1.171	-.633	1.165
6	5.983	4.170	2.961	1.543	1.364	1.161	.033	-.484	-.370
7	23.795	-3.934	-1.972	4.158	2.647	2.181	1.961	-.788	1.710
8	10.047	-.437	-1.348	.736	.278	-.005	-1.103	-.373	-1.342
9	-19.840	-7.704	-1.298	4.296	2.832	2.412	2.242	-.252	1.632
10	-19.145	-11.856	-5.357	-.447	-.780	-1.128	-2.314	-.405	-2.190
11	13.451	-6.455	-.901	2.359	1.746	1.521	1.477	-.033	1.106
12	11.133	-7.712	-3.543	-.570	-.633	-.820	-1.419	-.242	-1.240

MU = .3 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-13.332	3.812	4.171	-1.977	2.176	2.652	4.093	5.336	31.212
2	22.840	17.615	7.775	5.345	2.583	.996	-1.145	-1.341	4.078
3	10.252	4.517	10.710	5.952	5.843	7.481	2.641	-2.052	7.204
4	-15.617	4.148	1.908	.954	-1.266	-3.687	-.555	.165	1.399
5	-24.607	-11.980	-5.322	7.393	4.588	4.985	4.473	-.341	2.484
6	7.948	5.968	8.075	-2.713	-1.037	-.988	-2.364	-2.414	-1.825
7	25.285	-8.126	-4.209	2.167	.358	-.846	3.335	-2.100	.229
8	7.412	-.345	-2.653	3.043	2.662	3.869	-2.658	-3.839	-3.763
9	-23.610	-7.692	4.410	1.632	1.615	2.188	1.188	-4.491	-3.129
10	-14.446	-11.217	-9.260	.545	-.362	-1.075	-2.266	-2.282	-2.917
11	13.399	-10.037	-4.154	5.589	4.475	6.188	.199	-4.246	-3.329
12	10.244	-5.218	-1.650	-2.470	-2.127	-3.224	-1.085	-.513	-.995

TABLE III-B, CONTINUED

MU = .3 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-12.581	4.860	3.748	1.071	5.329	4.736	8.134	16.536	32.711
2	15.850	9.551	-1.091	6.739	8.609	8.313	5.908	2.498	7.853
3	7.434	9.456	22.264	12.585	3.634	4.126	3.806	15.535	6.172
4	-13.818	9.861	6.555	-.569	-2.963	-.387	-4.022	-21.989	-1.255
5	-9.733	-5.908	-6.843	-1.304	-6.072	-1.473	2.607	-.195	5.487
6	5.420	-2.530	-7.504	-3.057	-4.053	-2.559	-9.026	-10.350	-12.246
7	16.294	-11.160	-8.877	6.645	-1.270	-2.370	-2.358	-19.612	5.169
8	9.202	3.644	9.610	-9.192	-9.352	-3.741	-3.224	12.655	-10.479
9	-20.808	-8.264	-6.619	1.618	7.733	4.469	1.110	-1.659	-2.014
10	-20.245	-8.873	-10.657	.716	-2.898	-.249	.054	5.308	5.012
11	19.578	-5.686	9.874	3.587	.047	2.385	5.682	17.654	-5.455
12	8.797	-11.785	-1.598	-2.945	3.948	2.742	-.230	-3.837	7.233

MU = .3 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-10.279	10.221	12.745	14.913	-1.512	3.973	10.961	7.057	21.819
2	17.037	10.306	-4.024	-7.939	24.245	8.935	-2.875	5.590	8.416
3	4.889	-2.904	-.612	-3.836	9.870	7.592	22.606	7.161	-10.582
4	-21.322	1.125	-4.396	6.596	-25.279	-17.332	-11.036	-6.232	19.254
5	-18.926	-8.136	-4.090	12.353	-3.457	5.548	-6.773	6.645	5.705
6	8.798	-2.225	.659	-8.703	13.918	-4.955	6.378	-13.933	-9.286
7	28.052	-5.064	-8.595	2.519	10.425	.222	-2.884	-10.279	21.092
8	15.027	-1.564	-10.243	8.603	-16.718	5.890	-12.700	-.861	-27.515
9	-20.086	-9.080	-3.792	-.528	-.811	4.636	13.097	-9.876	-1.800
10	-12.528	-9.517	-13.623	-2.752	23.220	-.631	-6.294	4.994	-1.040
11	14.950	-12.359	-7.776	2.098	-.313	-2.686	-10.472	3.900	-20.329
12	10.109	-2.199	-1.038	1.237	-14.816	-2.911	9.974	.646	10.846

TABLE III-B, CONTINUED

MU = .4 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	.922	.730	.551	-.991	1.935	1.633	5.892	7.971	31.187
2	4.543	5.262	8.095	4.725	1.829	.483	-.679	.198	2.125
3	-12.846	-.486	4.639	3.728	2.583	.233	-.119	-.722	8.152
4	-7.145	.005	6.822	5.589	2.871	1.611	.805	1.508	.349
5	-1.990	-.812	-3.680	-1.972	-.455	-.438	-.638	1.784	2.047
6	2.702	5.590	2.701	2.262	1.857	1.588	1.291	1.155	.795
7	-.844	.528	-1.653	-1.676	-.744	-.373	-.787	1.097	2.554
8	-3.749	1.360	5.387	3.419	2.016	2.397	2.020	.468	-.242
9	-5.975	-6.407	-.925	-.228	.611	.040	-.535	1.240	1.803
10	-4.836	-2.825	3.051	3.272	3.627	2.994	2.472	.164	-1.203
11	.846	1.196	-4.272	-1.415	1.122	-.055	-.295	.681	1.084
12	-.710	1.717	-.595	.903	2.283	1.509	1.311	-.045	-.732

MU = .4 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	3.323	-1.301	1.098	.693	2.005	1.404	5.487	8.080	31.640
2	3.188	7.956	9.290	5.183	3.008	1.507	-.084	.900	2.850
3	-4.916	-.817	8.402	9.501	3.969	1.449	.800	1.133	10.759
4	-13.220	-1.211	3.136	-.095	2.381	1.428	.652	.597	-1.297
5	-3.885	4.819	-.580	.097	2.270	2.621	1.934	4.727	5.414
6	6.474	-.237	-.382	.071	-.038	-1.447	-1.330	-1.837	-2.831
7	-2.716	-1.451	-4.261	-6.217	.894	1.537	1.002	2.484	3.640
8	-5.209	4.784	7.629	7.372	.682	-.599	-.743	-2.043	-2.802
9	-.741	-10.267	-2.592	-1.365	.635	-1.558	-1.876	-.274	-.246
10	-8.793	-1.229	3.463	3.475	2.770	3.347	2.725	.460	-.571
11	-1.939	6.612	-1.384	2.883	.825	-2.844	-2.841	-1.609	-1.507
12	.779	-1.485	-2.268	-1.413	1.807	2.733	2.424	.929	.450

TABLE III-B, CONTINUED

MU = .4 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	2.807	.360	-2.738	.259	2.478	.932	6.189	6.000	28.993
2	1.091	1.699	6.962	5.201	4.590	3.417	-.510	-.933	1.785
3	-5.699	6.960	8.862	12.869	8.824	4.859	6.962	1.736	7.044
4	-3.627	-3.268	-1.449	-1.212	-2.945	-1.623	-5.178	-.501	1.575
5	-2.180	-3.061	-2.518	.800	7.604	8.368	5.415	6.094	3.174
6	-1.316	3.848	.591	1.083	-6.115	-6.287	-3.993	-2.759	-1.180
7	3.710	5.808	-6.307	-1.815	-.908	-.175	-2.245	3.241	4.693
8	-2.221	-5.951	3.070	-1.852	.555	2.138	2.812	-2.625	-5.628
9	-9.304	-11.223	-1.767	1.949	-3.913	-3.661	-2.288	.482	2.039
10	-4.269	1.346	2.625	.227	4.813	3.468	2.295	-1.133	-7.142
11	-1.044	-.879	-11.451	-8.190	-1.355	2.314	2.111	-.476	-.093
12	2.795	.967	3.738	4.226	2.598	-.552	-.431	-.362	-3.475

MU = .4 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	1.980	-.319	4.531	-2.999	-1.554	-.135	2.573	9.326	33.570
2	-4.409	1.519	-6.084	2.910	-.863	-.951	.988	4.536	10.154
3	-1.838	7.393	16.214	16.689	7.494	8.740	3.276	5.118	11.797
4	-6.652	3.324	16.121	-3.014	-2.615	-4.152	-.540	-1.788	4.411
5	-.681	1.706	-6.044	-5.142	-.123	3.137	5.906	7.047	8.136
6	6.236	-1.988	-14.894	7.191	5.094	.326	-4.799	-5.196	-1.122
7	-2.961	3.216	1.676	.552	2.334	.701	-2.815	-1.844	4.625
8	-3.833	5.568	20.633	-.055	.171	-3.640	-1.679	-1.795	-2.414
9	7.005	-10.952	-7.888	1.135	7.445	3.663	-6.389	-2.745	-1.538
10	-6.408	-.454	-8.411	4.561	-2.785	-3.404	-4.032	-3.128	.291
11	-.902	6.264	-1.263	7.266	1.317	-3.874	-1.102	1.542	-2.761
12	-1.731	-.256	5.705	-7.683	-.871	1.722	-4.101	-3.237	1.007

TABLE III-C

HARMONIC COEFFICIENTS D_{2K} OF EQUATION (54) FOR THE VELOCITY $\frac{4\pi R(V_i)_2}{\Gamma_2}$ OF TABLE II-C

HARMONIC COEFFICIENTS - LINEAR VORTEX SHEET

MU = .2 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-3.350	-3.655	-3.459	-3.618	-.202	-1.046	5.057	7.457	32.471
2	4.275	3.357	2.039	.867	.411	.145	.376	2.494	2.486
3	6.701	4.037	.338	1.403	2.006	1.732	3.276	4.766	4.872
4	-4.071	-.121	2.294	-.030	-1.182	-1.231	-1.992	-2.876	.757
5	1.600	1.853	2.507	1.948	1.928	2.100	3.277	5.762	.633
6	-3.600	-2.516	-2.510	-2.901	-2.894	-2.694	-3.906	-6.441	-.351
7	-1.865	-.284	3.674	1.494	.530	.545	.393	-.298	-.926
8	3.400	-.673	-4.217	-2.798	-1.984	-1.754	-2.189	-3.323	-.264
9	-1.520	-1.870	-1.115	-1.659	-2.045	-1.943	-3.165	-6.398	-2.483
10	.514	.533	.334	.504	.956	.950	1.765	3.564	.962
11	.682	-.733	-3.936	-2.879	-2.505	-2.206	-3.424	-6.372	-2.171
12	-2.066	.359	1.906	1.328	1.278	1.174	1.942	3.550	.839

MU = .2 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	3.315	6.800	6.338	.058	6.785	-3.684	5.477	9.452	31.707
2	-.945	-2.489	-3.288	4.615	.372	5.084	2.938	4.281	5.460
3	-6.741	-12.337	-7.689	-.170	11.877	7.624	6.985	10.044	1.275
4	-10.790	-1.883	3.723	-5.113	-12.264	2.493	-5.063	-8.939	2.841
5	-1.326	2.611	-6.429	-7.876	-8.441	3.518	3.922	6.862	1.915
6	-5.510	-1.546	-6.451	-.940	5.395	-6.748	-7.337	-11.157	-6.330
7	-1.607	-3.161	12.900	7.764	.794	-5.689	-3.337	-4.186	5.019
8	3.267	-3.571	8.903	-1.260	-4.181	-5.523	-.656	-1.453	-8.126
9	1.863	-4.383	-5.950	-.983	9.740	.244	-.305	-4.345	.336
10	.995	1.089	-6.730	4.630	-3.409	1.067	1.411	4.659	2.563
11	3.392	-.948	-7.190	-6.350	-13.636	8.394	5.419	1.079	-3.623
12	-1.605	.964	5.782	-1.742	6.503	2.004	-.053	2.590	5.005

TABLE III-C, CONTINUED

MU = .2 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-3.939	-3.182	-.998	.931	16.019	1.881	7.493	8.677	23.991
2	1.235	1.666	-1.105	-3.482	-19.027	4.058	3.652	7.717	8.300
3	7.023	5.447	3.600	-.125	-5.649	7.323	5.318	6.300	-6.858
4	3.537	1.902	.215	-.121	7.790	-10.928	-15.215	-10.681	18.186
5	-8.360	.402	2.012	3.957	8.661	-6.434	-2.671	7.750	4.870
6	-5.961	4.311	4.244	.145	-4.842	-1.921	-1.582	-15.915	-8.822
7	-1.597	3.223	1.824	-2.108	.853	6.375	.693	-1.116	15.438
8	9.927	-3.785	-5.468	-3.383	2.487	1.134	1.809	-1.985	-24.731
9	-1.031	-1.233	5.259	-.842	-7.679	-9.250	6.717	-3.580	-2.219
10	.970	3.163	-4.902	-.288	-9.903	5.767	-1.451	6.178	2.363
11	-1.692	.639	-6.693	-1.897	8.873	11.200	-12.388	-.498	-16.345
12	-.201	-4.166	2.192	-1.295	4.978	-4.572	4.783	3.345	12.631

MU = .2 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	1.773	6.021	3.060	-1.079	11.644	14.561	4.386	11.950	30.758
2	2.800	-2.340	-2.899	-3.468	-6.562	-35.752	6.868	12.025	13.532
3	-3.704	-6.775	-5.395	.519	12.936	-9.248	2.741	11.395	13.115
4	-10.946	-6.719	-.327	-6.867	-18.126	37.388	-20.001	-17.649	6.899
5	-1.551	3.544	-4.373	-8.596	-8.585	12.272	8.594	7.154	7.620
6	1.284	4.040	-4.642	3.128	9.750	-18.167	14.491	-13.877	-12.806
7	1.327	-4.517	11.658	5.844	.353	-3.524	.416	-2.003	-.392
8	-3.139	-4.982	8.718	-.911	-2.899	-1.162	-9.755	5.538	-16.042
9	7.194	1.307	-3.204	3.080	8.944	-.749	-7.814	-3.517	.130
10	2.749	-3.146	-6.264	1.911	-1.853	-10.462	-2.333	5.878	1.959
11	4.958	-1.550	-3.320	-1.550	-11.264	-.611	7.658	-6.203	3.865
12	-5.954	1.344	2.869	-4.445	1.722	12.448	2.404	-.252	6.884

TABLE III-C, CONTINUED

MU = .3 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-3.955	-.517	-1.090	-2.530	.483	-.643	4.515	3.526	31.303
2	9.849	9.111	5.179	2.819	1.842	.948	-.102	-2.963	.214
3	2.690	1.789	3.067	2.812	1.636	.513	.685	-2.151	6.230
4	.272	4.242	4.471	2.415	1.324	1.196	.556	-.816	-.335
5	-4.003	-1.358	.196	1.526	.760	.650	.596	-1.127	.677
6	2.683	1.625	1.519	.404	.264	.193	.002	-.034	-.010
7	6.432	3.055	1.011	2.961	1.888	1.557	1.385	-1.353	1.135
8	2.735	.359	-.798	-.376	-.589	-.703	-.848	.338	-.701
9	-3.105	.680	1.379	3.261	2.170	1.887	1.716	-.744	1.104
10	-4.658	-5.209	-3.177	-1.515	-1.449	-1.595	-1.821	.536	-1.313
11	3.929	-.588	.723	1.755	1.347	1.190	1.151	-.337	.784
12	2.229	-3.424	-2.130	-1.092	-.931	-1.016	-1.126	.270	-.756

MU = .3 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-4.126	-1.169	.198	-4.342	-.895	-.078	3.008	3.416	32.952
2	6.303	7.908	2.387	3.722	1.302	-.166	-1.110	-1.143	4.139
3	6.473	5.438	9.664	3.761	3.430	6.595	1.970	-3.334	7.046
4	-.350	.492	-.907	.484	-.842	-4.706	-.460	.913	1.698
5	-9.726	-3.827	-4.501	4.477	2.446	2.815	2.563	-2.232	1.275
6	4.941	4.212	7.658	-2.680	-1.134	-.973	-1.497	-.838	-.762
7	9.799	1.114	-1.536	.509	.162	-2.776	1.703	-3.583	-.872
8	-.182	-.202	-1.663	2.328	1.319	4.434	-1.371	-1.895	-2.044
9	-5.991	2.301	7.038	.573	1.029	1.497	.461	-4.963	-3.723
10	-.705	-5.840	-6.594	-.006	-.687	-1.007	-1.253	-.674	-.961
11	4.989	-3.010	-2.757	4.479	2.993	6.294	.123	-4.140	-3.495
12	.518	-1.900	.089	-2.469	-1.689	-3.405	-.701	.150	-.006

TABLE III-C, CONTINUED

MU = .3 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-3.430	-.836	.643	-1.998	2.825	1.654	6.285	14.065	33.856
2	1.370	.587	-4.435	4.105	6.949	6.268	5.090	.856	5.739
3	1.924	7.389	19.415	7.348	.829	2.020	1.555	14.611	6.627
4	.247	5.695	5.261	-.299	-2.966	-.569	-2.590	-23.003	-3.767
5	4.799	1.249	-4.738	-5.775	-8.903	-4.396	.121	-1.892	4.490
6	3.438	-2.455	-7.206	-2.958	-3.720	-1.255	-6.832	-9.784	-13.494
7	-.781	-3.940	-5.651	3.237	-2.569	-3.469	-2.772	-21.055	3.591
8	1.877	4.851	11.564	-7.568	-8.504	-2.591	-1.577	14.272	-10.062
9	-4.908	1.361	-2.240	-1.325	6.766	4.260	.718	-2.202	-3.282
10	-4.446	-1.746	-9.134	2.221	-1.766	.932	2.538	6.994	6.347
11	8.724	1.014	13.018	3.231	-.088	1.942	4.521	17.638	-6.016
12	1.278	-7.932	-1.085	-2.827	4.308	3.469	1.492	-3.062	8.006

MU = .3 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	-1.348	4.009	8.747	12.666	-5.027	-.737	8.732	4.211	22.922
2	2.984	1.131	-6.325	-11.614	20.578	7.166	-6.019	2.479	5.415
3	-.746	-5.207	-3.579	-8.972	4.697	2.556	20.779	5.985	-9.624
4	-7.672	-1.038	-4.028	9.745	-22.445	-15.455	-12.046	-7.793	16.396
5	-3.936	-1.690	-2.722	8.811	-6.468	4.389	-9.584	3.975	4.145
6	2.726	-3.899	3.242	-8.449	14.806	-5.166	7.572	-12.531	-8.932
7	11.723	3.540	-4.398	-.159	9.323	-1.866	-4.493	-12.657	18.213
8	5.114	-.963	-7.612	12.520	-14.844	10.205	-11.089	1.403	-24.808
9	-4.387	2.100	-1.261	-2.171	-2.792	1.148	11.776	-11.121	-3.522
10	.609	-6.467	-12.479	-3.275	24.309	2.459	-5.325	6.392	1.036
11	4.516	-4.167	-4.594	.700	-1.924	-.015	-11.501	3.256	-20.469
12	.336	.080	.868	3.011	-13.229	-4.040	10.230	1.093	11.406

TABLE III-C, CONTINUED

MU = .4 ONE BLADE

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	.473	-.967	-1.058	-3.105	-.362	-1.109	4.349	5.552	32.550
2	4.195	4.435	7.319	4.262	1.700	.309	-.866	-.245	1.735
3	-5.715	-1.441	3.058	3.427	2.610	.340	.331	-.877	8.849
4	-2.683	.209	5.923	4.928	2.316	1.107	.165	.929	-.234
5	-4.193	-2.470	-4.201	-2.434	-.979	-.836	-.828	1.667	1.986
6	-.566	2.220	1.959	1.402	.928	.540	.270	.176	.058
7	-1.667	-.655	-2.347	-1.998	-1.038	-.588	-.736	1.058	2.547
8	-2.022	.264	3.927	2.473	1.020	1.285	.908	-.573	-1.019
9	-3.607	-3.592	-1.163	-.416	.441	.027	-.422	1.306	1.822
10	-3.869	-1.566	2.258	2.280	2.515	1.847	1.295	-.897	-1.995
11	-1.234	.845	-3.490	-1.514	.970	-.100	-.223	.712	1.091
12	-1.619	1.090	-.512	.393	1.684	.897	.711	-.588	-1.133

MU = .4 TWO BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	2.341	-3.398	-.905	-1.561	-.665	-1.379	3.826	5.509	33.043
2	1.802	6.277	7.692	4.197	1.977	.945	-.663	.086	2.356
3	.317	-3.311	5.561	8.429	3.083	1.129	.693	.367	11.137
4	-8.051	-.210	2.593	-.604	1.681	.771	.002	.073	-1.892
5	-8.155	1.329	-2.736	-1.616	.131	1.290	.751	3.617	4.709
6	4.445	-2.221	-.032	.165	-.021	-1.995	-1.717	-2.174	-3.235
7	-4.300	-2.876	-5.695	-7.310	-.710	.386	.204	1.626	2.899
8	-2.691	3.943	6.929	7.347	.939	-.868	-.991	-2.247	-2.938
9	1.259	-7.294	-2.937	-1.510	.141	-1.995	-2.033	-.505	-.767
10	-6.920	.471	3.259	2.872	2.412	2.891	2.140	.027	-.593
11	-4.399	5.594	-.756	3.081	.907	-2.904	-2.673	-1.542	-1.752
12	.413	-1.496	-1.831	-1.866	1.406	2.383	2.014	.618	.444

TABLE III-C, CONTINUED

MU = .4 THREE BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	1.177	-1.097	-3.213	-2.318	.213	-2.254	4.895	3.912	30.859
2	-.452	1.620	8.161	3.995	3.797	2.286	-.980	-1.385	1.812
3	-2.143	3.478	5.838	9.995	7.488	2.966	6.570	.833	7.118
4	1.025	-.668	1.245	-.348	-2.900	-1.394	-5.722	-.908	1.472
5	-5.148	-5.381	-2.810	-1.981	4.929	5.463	3.366	4.344	1.707
6	-5.736	1.466	1.535	1.810	-5.602	-5.831	-3.780	-2.673	-.669
7	2.615	4.831	-4.572	-2.828	-2.283	-1.619	-3.945	1.484	3.081
8	-1.497	-6.059	1.667	-1.657	.509	2.047	3.434	-1.998	-4.462
9	-6.630	-8.241	-.254	1.069	-4.711	-4.555	-3.000	-.493	.958
10	-5.469	2.931	1.077	.810	5.115	4.007	2.657	-.481	-5.767
11	-2.655	-.724	-9.159	-8.840	-2.423	1.069	2.011	-.805	-.532
12	.750	.334	2.909	4.568	3.068	.110	-.346	-.089	-2.793

MU = .4 FOUR BLADES

XP

K	.15	.25	.35	.45	.55	.65	.75	.85	.95
1	1.083	-3.340	2.513	-5.365	-4.051	-2.555	1.098	6.640	34.242
2	-3.186	.383	-7.193	1.036	-1.999	-1.433	.448	2.449	7.499
3	.578	1.436	10.654	12.709	4.333	6.484	1.163	3.908	11.621
4	-2.696	4.354	17.242	-1.912	-1.590	-3.329	.294	-3.400	2.013
5	-3.644	-2.446	-7.635	-8.911	-4.209	-.448	2.474	4.665	6.241
6	1.925	-2.990	-14.869	7.790	6.310	1.541	-3.356	-5.480	-2.169
7	-5.781	2.110	1.230	-1.623	-.062	-1.451	-4.277	-3.917	2.861
8	-4.279	2.331	19.045	1.318	1.801	-2.408	-.728	-1.070	-2.269
9	6.898	-7.426	-7.187	-.962	5.685	2.328	-7.019	-3.597	-2.407
10	-4.845	.947	-10.236	6.298	-.991	-1.708	-2.505	-2.204	.896
11	-5.615	6.301	.525	6.488	.925	-4.783	-1.982	1.391	-2.949
12	-2.097	-2.540	4.752	-6.869	-.295	2.665	-2.948	-2.794	1.340

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